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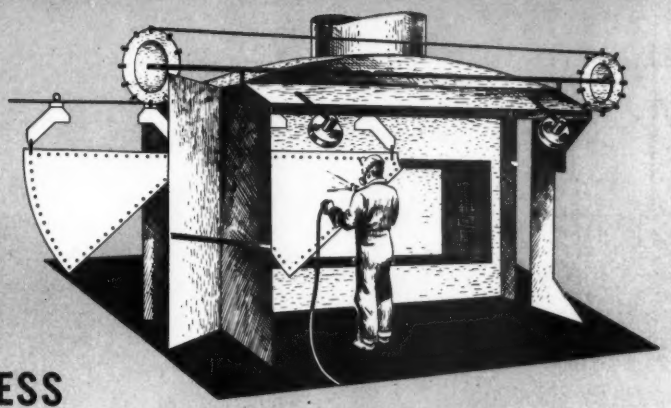

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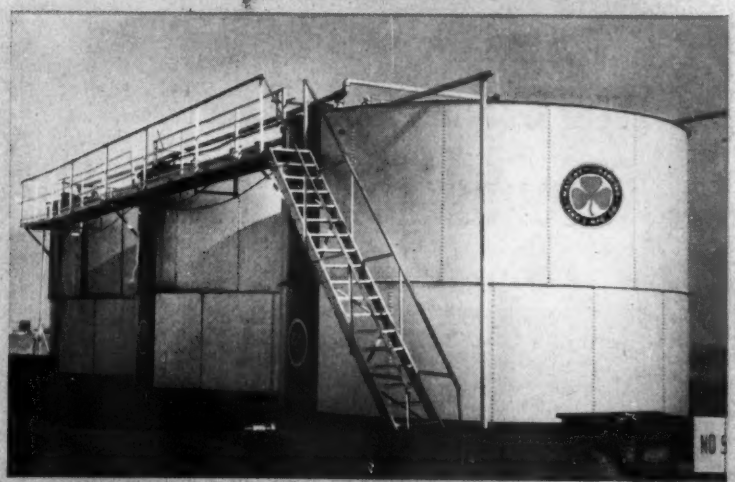

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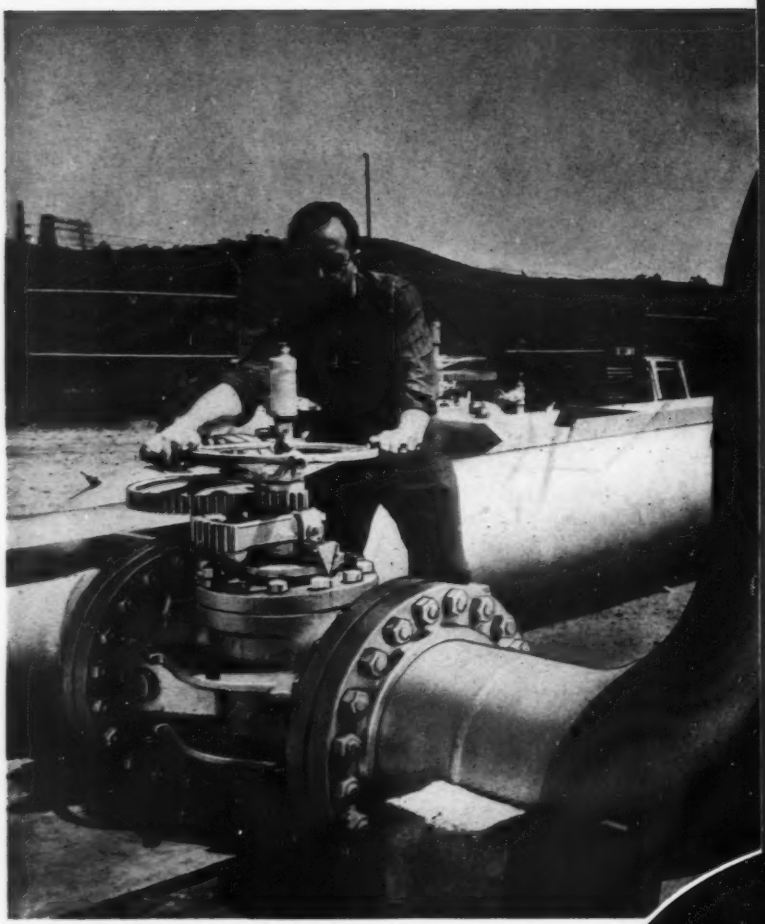

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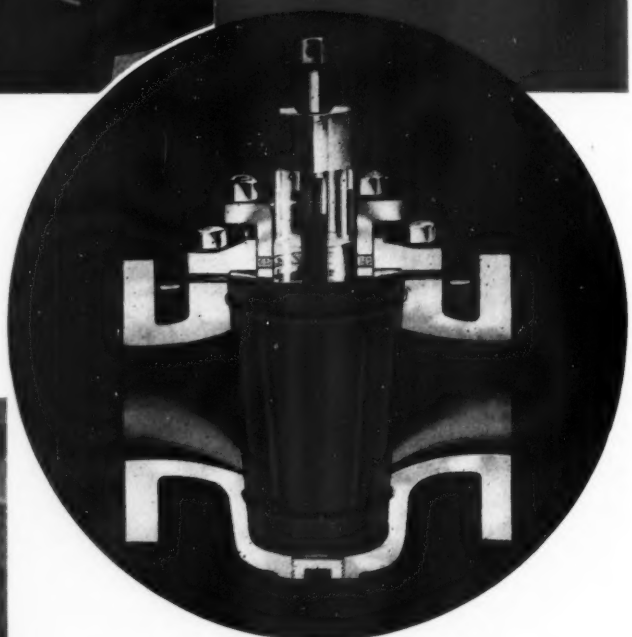

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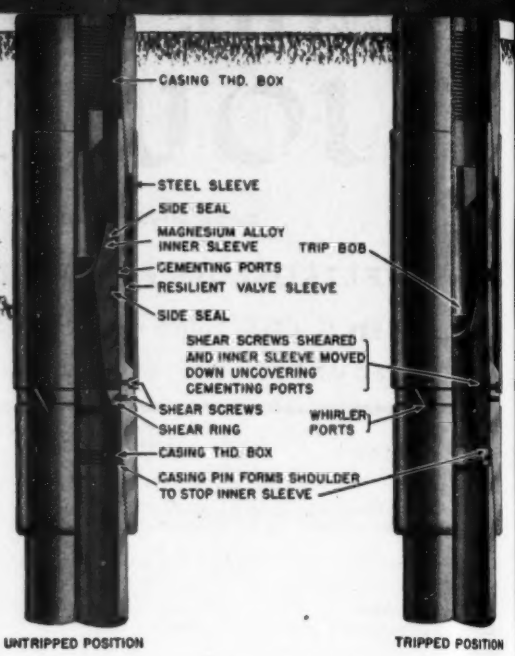

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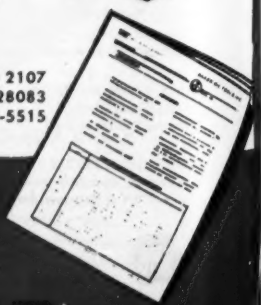

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Peacetime Washington

PRESIDENT TRUMAN in conferring upon W. R. Boyd, Jr., the highest award granted a civilian for war service said this industry's contribution represented "the greatest government-industry partnership in the history of the United States." This was fitting tribute to the oil business and its leadership and should end the political sniping of those who find it difficult to give the petroleum industry credit for anything.

Having terminated the Petroleum Administration for War the President has now directed Mr. Krug to establish an organization to "assure coordination in peacetime of the federal Government's many interests in petroleum." An oil and gas division has been organized in the Department of Interior and its functions in broad terms have been outlined.

So having officially ended its war duties the oil business is now faced with the equally important duty of determining what its peacetime activities from the nation's capital should be. That there will be some type of organization there can be no doubt.

At this stage of the Washington planning the essential difference between peacetime and emergency needs should be made clear. There are those impressed by the unparalleled accomplishments of industry during the war who contend that government controls should be continued in the reestablishment of a normal economy. The war debt, of itself, is sufficient answer to this viewpoint. Furthermore this attitude reflects a lack of understanding of why industry in this country was able to respond to an emergency with a flood of war materials, equipment, and commodities.

The success of the war's government-industry oil partnership stemmed from a free industry with its initiative, know-how, and trained personnel. Washington's planning was successful because the oil business had its house in order in keeping pace with peacetime requirements. Now the industry needs to be let alone to repair its fences and as a competitive enterprise serve all of its customers and get ready for another possible emergency.

Then there is the proposal that a representative group from the industry be appointed to advise with the Government's oil organization, a part of the war program which was outstandingly successful. It is certain representative leaders of the industry will be willing to continue to do their part in an advisory capacity.

But the legal position of these operators must be clearly and permanently understood. A statement by the Department of Justice that all is well is not sufficient. Oil operators know the temporary aspects of these promises from past experience. If additional legislation clarifying existing antitrust acts is necessary let this be done. Otherwise the industry-government partnership of the war must end now.

Divergent Views Held by Industry And Lawmakers on Public Lands

by Henry D. Ralph

WASHINGTON. — The oil industry and the Interior Department are far apart on the question of developing oil and gas on the public domain, it was apparent last week at hearings before both Senate and House committees on public lands covering bills to liberalize the General Leasing Act.

Department officials agreed, in theory at least, with the industry's statements that there is a real need to find more oil in this country. But they opposed provisions in the Hatch-O'Mahoney bill (S. 1236) which the industry said are essential to make possible more extensive exploration and development on government-owned lands. At least a dozen industry men testified that the legislation desired by the department would deter exploration, hold down production, and work particular hardships on small and independent operators.

A great many revisions in the leasing laws are proposed in the Hatch-O'Mahoney bill in the Senate, a somewhat similar Fernandez bill in the House, and the substitute offered by the department. The department agrees with the industry on some of the proposals but takes violent exception to others.

The issue was summarized by a colloquy which took place at the hearings between Sen. Joseph C. O'Mahoney of Wyoming and Secretary of the Interior J. A. Krug.

The senator said that as a matter of high public policy the Government should actively promote an intensive search for new oil but this is being hampered by two errors in the department's thinking, one that the department is the owner or proprietor of public lands, and two that conservation demands prevention of the search for oil.

Krug flatly denied this, but he insisted that of equal importance with exploration and conservation are the department's responsibilities to prevent monopoly and the concentration of economic power and to obtain the highest possible return to the Government for commercial activities on the public lands.

Typical of the entire controversy was the lengthy debate over options to conduct geophysical and geological exploration on public lands. The present law is silent on this subject, and the practice has developed whereby operators assemble options from the owners and leasees of both public and private lands in large areas. Now the department attorneys think this might be illegal, but are willing to have the law authorize it.

The Hatch-O'Mahoney bill permits exploration options up to 100,000 acres per operator, but the department insists that this would foster monopoly and 64,000 acres is sufficient. Secretary Krug finally admitted that he personally didn't feel very strongly about the matter, but his subordinates continued to assert that while 64,000 acres is all right, an additional 36,000 acres under option to a single operator would constitute monopoly and concentration of economic power.

Single-Operator Acreage

A similar situation developed over the acreage of public lands that a single operator may lease in one state. The present limitation is 7,680 acres, and S. 1236 proposes to increase this to 15,360 acres. The department had gone on record against this, suggesting as an alternative that it be given discretion to permit holdings larger than 7,680 acres if its investigations in individual cases showed no danger of monopolistic tendencies. Before the Senate committee Secretary Krug withdrew the opposition to this, admitting that it would create a serious administrative burden, and saying:

"I am not prepared to say that the proposed increase in the state acreage limitations from 7,680 to 15,360 acres would, in and of itself, create a serious danger of monopoly."

The industry's chief complaint, it developed at the hearings, is that the department refuses to accept established commercial practices which are satisfactory to virtually all private landowners and state governments, but insists on special provisions designed to bring in a little more money but which result in a lot of red tape, interminable delays in obtaining decisions, uncertainty as to the ultimate cost of operating on public lands, and discouragement of all prospectors but particularly the smaller independents.

The industry wants the Government to use the universal flat 12½ per cent royalty, while the department insists on retaining its step-scale royalty which may run up to 25 per cent. Even though this averages only 8/10 of 1 per cent higher than the 12½ per cent rate, the department says it is necessary to curb possible overproduction.

The industry wants the Government to take its royalty oil in kind or else accept the posted market price for it. The department wants to keep the right to fix an arbitrary price which the producer must pay in cash even though the oil can't be sold for such a price. The argument is that if a producer had a monopoly in a field he might gyp the Government by keeping the posted price too low.

The chief amendments which the industry wants made in the leasing act were summarized as follows by A. C. Mattei of the Honolulu Oil Corp., one of a dozen witnesses from the Rocky Mountain Oil and Gas Association:

1. Fix the royalty at 12½ per cent.
2. Enlarge the acreage limitations to 15,360 acres in any one state.
3. Except from acreage limitation (a) leases obtained upon competitive biddings, (b) leases that have been on production for 5 years, and (c) leases subject to plans for unit or cooperative development.
4. Permit an operator to take geological or geophysical options from government lessees or applicants for 2 years, without limit as to area.
5. Permit an assignment of a lease to any qualified applicant, which shall be conclusively presumed to have been approved, if not disapproved by the secretary within 6 months for lack of qualification of the assignee or insufficiency of bond.
6. Authorize the secretary to delegate to a state agency or other person or committee control over development and production under plans for unit or cooperative development.
7. Permit drilling of wildcat wells by two or more persons as tenants in common of a government lease without being penalized by excessive acreage charge.
8. Expressly provide that only lands within known geological structures of producing oil or gas fields shall be leased upon competitive bidding, rather than that the secretary may lease upon bidding lands merely believed to be valuable for oil or gas development.
9. Make a number of relatively minor changes in administrative details.

Phillips-Shamrock Plan 360-Mile Products Line

AMARILLO, Tex.—Phillips Petroleum Co. and Shamrock Oil & Gas Co. will build a 360-mile 6-in. pipe line to connect their Texas Panhandle refineries at Phillips, Tex., and McKee, Tex., with delivery terminals at La Junta, Colo., and Denver, Colo.

Initial capacity of the line will be 5,500 bbl. daily, with a total capacity of 15,000 bbl. daily through additional pump stations. The new project, costing $5,000,000, will be a joint operation, with Phillips in charge.

Interior Funds Get Trimming; Oil Agencies Included

WASHINGTON.—Many branches of the oil industry will be affected by the 50 per cent cut in funds meted out to the Interior Department by the House appropriations committee. In addition to the cut in appropriations, the committee administered a verbal chastisement to the department in reporting its recommendations for funds to cover the 1946-47 fiscal year.

The bill carries $174,652,579, which is $172,113,251 below what the Bureau of the Budget recommended and $24,201,248 less than the department has for the current fiscal year.

Every bureau and division of the department was given a substantial reduction.

During the hearings the committee bore down hard on virtually every bureau chief, and went over his budget estimates with a fine-tooth comb. The standard explanation was that routine work had piled up or been deferred during the war and it is now necessary to expand the department to catch up with this and to take on new responsibilities.

The committee's attitude, expressed forcefully by several members during the course of the hearings, is that during the past few years the department got a lot of extra money for special war jobs and is now attempting to keep its budget and staff at the inflated wartime level.

An extensive program of searching for additional minerals during the next fiscal year was projected by the U. S. Geological Survey, but the House appropriations committee did not think much of it.

The committee recommended that $7,993,445 be appropriated for the survey, which is $5,172,555 less than recommended by the Budget Bureau and $176,585 more than the funds for the current year. Cuts were made in all activities of the survey, but were heaviest in items for topographic and geologic surveys, and for classification of mineral lands.

Director William E. Wrather and Chief Geologist W. H. Bradley tried to explain that our mineral resources have been badly depleted during the war and an intensive exploratory program is required; also that oil and mining industries are anxious to find new deposits and need the assistance that USGS can give if it has sufficient funds.

But the appropriations committee, in reporting the bill, said:

"The committee is shocked to find that this agency has asked for a very substantial increase over and above wartime appropriations."

Funds for Bureau of Mines research on secondary recovery were cut by the House appropriations committee $50,000 below the amount approved by the Budget Bureau, but the bill still carries $150,000 more than the bureau has had for this work during the present fiscal year, which is only $113,000.

R. A. Cattell, chief of the Oil and Natural Gas Division, told the committee that most of the funds will be spent in the Pennsylvania grade crude region, but smaller sums will be used for Mid-Continent studies at the bureau's stations in Bartlesville, Okla., and Dallas.

Research Funds Also Cut

The appropriations committee also lopped $10,000 off a requested $25,000 appropriation for Cattell's division to study the thermodynamics of hydrocarbons, and $5,000 off a proposed $30,000 increase for activities at the Bartlesville station.

The bureau is not going to do any more "drilling for anomaly" in an oil field without first arranging with nearby property owners to pay the Government a percentage of the minerals extracted as a result of the bureau's explorations.

Such a provision, leaving the amounts to be paid to the discretion of the Secretary of the Interior, was written into the department's appropriation bill after B. of M. officials got a thorough grilling about a so-called "wildcat" well drilled in New Madrid County, Missouri.

Dr. R. R. Sayers, director of the bureau, explained that the bureau was testing a "magnetic anomaly" and hoped to find a deposit of magnetite iron ore. A heavy-duty oil rig was used because no other was available.

The Petroleum Conservation Division, which was abolished the same week the bill was reported, was denied expansion funds in the Interior Department's appropriation bill.

The funds requested were for enforcement of the Connally "hot oil" act, which will now be one of the functions of the new Oil and Gas Division. A supplemental appropriation will be asked for this new division, but it is doubtful if the appropriations committee will earmark any larger sum for the Connally act.

As reported, the bill carries $216,908 for the conservation division, which is a reduction of $30,092 in the budget estimates and $18,796 in excess of current year requirements. The budget had contemplated bringing the Washington office up to prewar strength and five additional examiners and four clerks in the field. There are now 21 examiners in the field, and before the war there were more than 30.

Gas Under Connally Act?

Acting Director E. B. Swanson told the committee that control of natural gas might be brought under the Connally act.

"It is a point that has never been finally determined," he said. "My own view is it does not come under the act. Also, it should come under the act."

An admission that the General Land Office is far behind in its oil and gas leasing work was made by Commissioner Fred W. Johnson in testifying before the House appropriations committee.

The committee recommended that the Land Office receive $2,958,374 for the next fiscal year, which is $89,549 more than it has for this year but $724,326 less than recommended by the Bureau of the Budget.

Johnson said that the Land Office was badly understaffed all during the war, and the consequence has been the accumulation of sizable arrearages in its work, and that literally thousands of mineral leasing cases are awaiting action.

Secretary Krug had nothing to do with the slash in the Interior Department's funds made by the House appropriations committee. The budget estimates had been drawn up and the committee was virtually through with its hearings by the time he took office.

However, the new secretary appeared before the appropriations group and discussed his philosophy for running the department, in the course of which he said:

"I want to do my best to make the department a going concern, staffed by competent people, working as a team on the many varied and important national problems that fall within the jurisdiction of the Department of the Interior.

"I feel, from what I know about it, that there has been a tendency in the past for the department to operate as a confederacy, a very loose confederacy of bureaus and agencies, and I would like to try to knit them together more closely, if that is possible.

"I shall do my best to avoid overlapping and duplication between the various offices and bureaus and provide administration based on merit and competency of the people employed by the department in carrying out the great responsibilities entrusted to the department."

Texas Company Will Build Major East Coast Refinery

NEW YORK.—The Texas Co. this week disclosed plans for construction of a major East Coast refinery on a site already acquired on the Delaware River opposite the Philadelphia Navy yard.

The plant, not expected to be in initial operation until sometime in 1948, will be the company's first major East Coast processing unit. The Texas Co. has acquired the 1,368-acre tract to end a 2-year search for a suitable location. W. S. S. Rodgers, The Texas Co. board chairman, said the new refinery will be strategically located to receive both foreign and domestic crude.

Construction plans are incomplete and depend largely on the availability of materials for the refinery, Rodgers said. The refinery will be an ultra-modern plant incorporating the benefits of wartime petroleum research and technological advances in refining. In the first phase of its operations it will process motor fuels, diesel fuels and furnace and industrial fuel oils.

Other Texas Co. Refineries

Other products will be announced as additional refinery units are constructed. The refinery is a key project in Texaco's postwar expansion program. It will be the company's twenty-first plant for processing petroleum. The 20 refineries now in operation are spread from coast to coast.

Other refineries of The Texas Co. and their daily crude capacity are at Port Arthur, Tex., 135,000 bbl.; Port Neches, Tex., 40,000 bbl.; Houston, 27,500 bbl.; West Dallas, 15,000 bbl.; San Antonio, 6,000 bbl.; El Paso, 2,500 bbl.; Amarillo, 7,500 bbl.; West Tulsa, 22,000 bbl.; Lockport, Ill., 50,000 bbl.; Lawrenceville, Ill., 30,000 bbl.; Casper, Wyo., 7,000 bbl.; Craig, Colo., 3,000 bbl.; Cody, Wyo., 3,000 bbl.; Calpet, Wyo., 400 bbl.; Sunburst, Mont., 7,500 bbl.; Norfolk, Va., 2,000 bbl.; Claymont, Del., 3,500 bbl.; Providence, R. I., 3,500 bbl.; Los Angeles, 40,000 bbl.; and Fillmore, Calif., 4,000 bbl. Asphalt refining is carried on at the plants at Norfolk, Va., Claymont, Del., and Providence, R. I.

The Texas Co.'s principal foreign production properties are located in the Middle East. With Standard Oil Co. of California it is the joint owner of Arabian American Oil Co. which has a current production of 170,000 bbl. daily in Saudi Arabia inland a short distance from the Persian Gulf. At present all but a small part of this crude oil is being refined at the new Ras Tanura refinery of the company in Saudi Arabia and the refinery of the Bahrein Petroleum Co., Ltd., on Bahrein Island a short distance off the coast of Saudi Arabia.

The Bahrein company which has a controlled production of 20,000 bbl. daily on Bahrein Island is also jointly owned by The Texas Co. and the Standard Oil Co. of California.

The Texas Co. is also one of the small producers in Venezuela with large concession holdings. With the Socony-Vacuum Oil Co., Inc., it is the joint owner of the Colombian Petroleum Co. which operates the Barco concession in eastern Colombia. This crude is delivered to Cartagena by pipe line. Present production in Colombia is approximately 16,000 bbl. daily. The Texas Co. through a subsidiary also has a large concession in Colombia. Its only refinery facilities in South America is a refinery of small capacity owned jointly with the Socony-Vacuum Oil Co., Inc., in Argentina. The company's distribution outside the United States directly or through affiliated or jointly owned facilities is world-wide.

Coal Strike Seen as Excuse For Delay in Oil-Price Decontrol

WASHINGTON.—Paul Porter, Office of Price Administration head, last week saw in the national coal strike the possibility of further delay in the removal of petroleum price controls.

Testifying before the Senate banking and currency committee, Porter said he had hoped to have all petroleum price ceilings suspended by June 30 and was planning to start off by lifting the gasoline ceiling the middle of May, followed by one product after another.

But now, he said, the coal strike has created an emergency which makes it dangerous to lift oil controls. Shortage of coal might create an abnormal demand for fuel oil or some other products, and this would put an upward pressure on prices, and so oil controls will have to be continued for a while, he added.

Pressed by Senator Taft of Ohio for a more specific answer, Porter said he was still hopeful that petroleum price ceilings could be suspended before fall.

Confirms Industry Conviction

Industry representatives commented that this only confirms the impression they have had for many months—that OPA is determined not to let oil prices go up and will always manage to find some excuse for retaining controls.

Several members of the Senate committee reached a similar conclusion. Senator Hickenlooper of Iowa read Porter a series of statements by high administration officials promising to decontrol any commodity when supply approximates demand. Senator Milliken of Colorado told Porter that if OPA waits until no price increases are in prospect, controls will never be dropped. And Taft observed that since OPA is evidently not intending to keep its decontrol promises Congress has no alternative but to write into the new law a provision forcing OPA to drop controls automatically when production of any commodity reaches a given level.

The Senate committee has now completed its hearings and should have a report to the Senate in a week or so. Observers believe its bill will not "cripple" OPA as much as the version passed by the House, but it will remove a good deal of that agency's discretion.

Chief attention will center on the decontrol formula, which most Senators and even some administration officials feel must be adopted. It is generally agreed that production equal to the prewar level is not an adequate formula for all commodities, particularly where there is a large pent-up consumer demand. For example, nylon stockings are being produced far above prewar levels but far below current demand, and prices would skyrocket if controls were removed.

The Senate's problem is to devise a formula which will force OPA to drop controls over a commodity like oil where supply is considered sufficient to meet consumer demands and yet keep controls on commodities still in short supply even though output may be higher than prewar.

THIS 1946 WEEK

S M T W T F S

REFINING—The Texas Co. reveals it has acquired 1,368 acres near Philadelphia as the site of its first major East Coast refinery. . . . Construction plans indefinite depending on materials but first unit expected to be operating in 1948. . . . ¶Government expected to order premium gasoline octane limit of 78.5 following meeting between CPA and industry officials. . . . Officials also studying ceiling on housebrand octane in another move to conserve lead supply. . . . Critical lead shortage worsened by coal shutdown. . . . ¶Gasoline stock drop sharply in the face of withdrawals to meet record consumption. . . .

INTERNATIONAL—Phillips Venezuelan Oil brings under control wild well on Malta Grande concession in State of Monagas, Venezuela. . . . Strike opens new pool in eastern Venezuela. . . . ¶Secretary of Interior Krug indicates action forthcoming on Anglo-American treaty. . . . Possible broadening of treaty to include Russia, and other nations, rumored. . . . Krug backs agreement. . . . Describes it as first step in solving international oil problems. . . . ¶President Truman says he has not seen reported letter from King Ibn Saudi on cancellation of oil concessions. . . . Letter supposedly tells president United States' stand on admitting Jews to Palestine may lead to cancellation. . . . Story generally discounted. . . .

LEGISLATION—House and Senate committee hearings on amending public lands leasing bill attracts lively interest. . . . Industry representatives ask liberalization of bill to encourage development. . . . Interior Department attacked by Senator O'Mahoney who says department considers itself "proprietor" of public lands. . . . Krug contends some proposed provisions would breed monopoly. . . . ¶Interior Department bureaus take drubbing at hands of House appropriations committee. . .

TRANSPORTATION—Phillips Petroleum and Shamrock Oil & Gas announce plans to build 360-mile 6-in. products line from Texas Panhandle to Denver. . . . Construction not likely for several months. . . . ¶Northwest Refining Co. inaugurates shipments of Rocky Mountain crude for St. Paul refinery. . . . Crude moves by pipe line to St. Louis, then up the Mississippi. . . . ¶Warren Petroleum nears completion of first link in new $2,000,000 pipe line and terminal project in Houston area. . . .

PRICES—Paul Porter, OPA head, tells Senate group he had planned to start oil decontrol by suspending gasoline ceiling this month. . . . Asserts coal strike has created fuel emergency and that action will be delayed. . . . ¶Natural gasoline prices react to steadily rising gasoline market. . . . Quotations up 1/4 cent.

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LABOR—Eighty-four producing wells on Wirt Franklin properties in southern Oklahoma shut down in walkout of 17 C.I.O. production employes. . . . Strike follows deadlock in negotiations at Dallas. . . . Houston Engineers Club rejects unionization of professional engineers by unanimous vote. . . .

NATURAL GAS—Construction of $2,356,240 casinghead gas processing plant in Anahuac field, Chambers County, Texas, by Humble Oil & Refining Co. approved by CPA officials in Houston. . . .

Virtually all segments of the oil industry, in one form or another, last week felt the effects of the coal strike emergency. In the Chicago area severe restrictions were placed on the use of electric power because of the dwindling coal supply. Here two Chicago filling station operators use an old-fashioned hand pump on a loaded drum to serve their customers in place of electrically-operated gasoline pumps which they normally use to serve their customers. (Photo by Acme)

The new officers of the N. A. C. E. for 1946 are: O. C. Mudd, Shell Pipe Line Co., treasurer; F. J. McElhatton, Panhandle-Eastern Pipe Line Co., president; and G. R. Olson, United Gas Pipe Line Co., vice president

Engineers Study Means of Combating Costly Corrosion

by Arch L. Foster

KANSAS CITY. — The tremendous amounts of corrosion occurring in the oil and gas industries make the combating of corrosion one of the major problems of these industries. Such is the definite conclusion drawn from the discussions of the National Association of Corrosion Engineers meeting here May 7-9. More than 500 broadly experienced engineers, meeting to compare notes on their several problems in minimizing corrosion of all types of metallic equipment in various industries, have proved conclusively that the practical elimination of corrosion reduces very significantly one extremely important factor in the total cost of producing the many items of commerce and industry in a modern civilization.

Tubing corrosion in the Erath field, Louisiana, is greatest at the 10,400 and 11,600-ft. zones, experience of Texas Co. engineers has shown. The other horizons show less corrosion, with the minimum corrosion rate appearing in the shallowest sands, W. D. Yale, of The Texas Co., reports. Replacements of wing valves and choke tips in one well after only 5 months' operation caused the company to pull tubing from the well, which showed that the entire string must be replaced, Yale said. In one string 142 joints showed a reduction in tubing-wall thickness of 15 to 30 per cent. It was found that all well tubing must be replaced immediately, and that replacement periods of 18 months must be observed unless some means could be found for reducing the corrosion rate. This corrosion is of the acid-type attack, Yale stated, believed to be caused by dissolved carbon dioxide or organic acids or both.

Sodium dichromate and sodium hydroxide are the two main chemicals used in the Erath field. From 4 to 5 lb. of dichromate were added per day to control corrosion after injecting 20 lb. of dichromate per day until the dichromate shows up in the return water. The effort was made to maintain 500 to 1,000 p.p.m. of CrO_4 in the water produced in the well. Eight wells in this field are now being used to inject dichromate, so that less than 5 p.p.m. of iron are found in the produced water, which shows that corrosion is reduced 88 per cent or more. Caustic injection showed erratic results and has been discontinued in favor of dichromate.

Pit-Hole Leaks Eliminated

Pit-hole leaks have been eliminated during a 62-month period of cathodic treatment combating microbiological corrosion in a pipe line, which shows that cathodic protection for this cause of corrosion is practicable, says William E. Huddleston, consulting engineer. A 35-amp. cathodic rectifier was installed on a river-crossing section of a 24-in. line, with a pipe-to-soil potential of 1 volt maintained. From a pit leak rate of one each 10 to 15 days to a record of no-corrosion leaks over a period of 3 years has shown that cathodic protection can be essentially perfect when applied properly.

Many well-tubing failures occur at

Left: These leaders spoke before the oil-industry symposium meeting in Kansas City. They are: back row, B. B. Morton, International Nickel Co.; M. E. Holmberg, Phillips Petroleum Co.; Paul Menaul, Stanolind Oil & Gas Co.; H. T. Griffin and E. C. Greco, United Gas Pipe Line Co. Front row: Walter F. Rogers, Gulf Oil Corp.; R. V. Smith, U. S. Bureau of Mines; and Harry Waldrip, Gulf Oil Corp. Right: This group of speakers includes P. D. Mellon, Canadian Western Natural Gas Co.; Michael Curran, Owens-Corning Fiberglas Corp.; H. A. Robinson, Dow Chemical Co.; W. E. Huddleston, consulting engineer; and Chris. Goldkamp, Pacific Gas & Electric Co.

a ring of interior corrosion near the upset, M. E. Holmberg, of Phillips Petroleum Co., stated. This ring near the upset is exposed to a temperature gradient; the grain size of the metal which is heated below the recrystallization temperature is not changed. That heated just above that temperature is very fine grain structure; that heated to still higher temperatures will have larger grain size, the size depending on the temperature and the length of time it is maintained at the temperature above the recrystallization point. The corrosion of tubing at the ends, greater than elsewhere in the tube, may be traceable to the relatively thick, heavy mill scale which forms during the upsetting operation. Steels with a pearlitic structure corrode less rapidly than steel with a spheroidized structure, Holmberg stated. Formation of thin films of iron carbonate and of magnetite, Fe_3O_4, appear to protect the steel underneath the film; these coatings seem to be formed by the action of carbon dioxide on the metal on the surface.

Excessive corrosion rates in high-pressure condensate wells may be traceable to a combination of two major factors, say E. C. Greco and H. T. Griffin, of United Gas Pipe Line Co. These factors are direct acid attack plus the erosion of the corrosion products by the flow of materials such as water, oil, gas, etc. Carbonic acid formed in the condensate water by solution of carbon dioxide from the gas phase and organic acids, attacks the tubing wall. Organic acids in the water phase also attack the ferrous carbonate, forming the iron salt of the organic acid and releasing carbon dioxide, Greco and Griffin stated. These ferrous salts are easily soluble in water and thus are carried away from the tubing wall, leaving bare metal open to further attack. Research workers in high-pressure-well corrosion are generally agreed that organic acids play a major role in tubing corrosion. These authors believe that naturally occurring hydrocarbon condensates contain natural inhibitors which may protect the well tubing or other metal even in the presence of corrosive concentrations of other materials such as carbonic acid and organic acids.

It has been well established that the presence of fatty acids in condensate water from high-pressure gas wells is responsible for much of the corrosion of steel equipment exposed to the water, these authors stated. Samples of water produced from more than 10,000 ft. and more than 13,000 ft. when heated give off distinct odors of butyric, acetic, and other organic acids, they found. Also, when these waters were heated the acidity increased, that is, the pH was reduced. One sample showed a drop in pH from 5.75 to 4.61, after being heated for only a few minutes at 200° F., which they interpret to mean that the iron salt of the fatty acid, such as ferrous or ferric acetate, is hydrolyzed quickly by the heat to release the organic acid. One of the methods used to analyze these condensate well waters is as follows: A sample showing a pH of 5.35 showed a drop to 4.60 after brief heating. Twenty-two liters of raw water were evaporated after the pH was fixed at 11 with 10 per cent sodium hydroxide solution, and filtering off the precipitated iron. When the total volume of liquid was reduced to about 1 liter the remainder of the evaporation was carried out on a steam bath. The solids left in the vessel were neutralized with dilute HCl until slightly acid, after which sodium carbonate was added to the point of slight alkalinity. Carbon dioxide was bubbled through the solution for 45 minutes and then phenols were removed by steam distillation.

Ether Extraction Used

This steam distillate was made alkaline with NaOH and extracted with ether; then made acid with 85 per cent phosphoric acid and again ether extracted. This produced fairly pure phenols which were identified by bromination and nitration to yield 2:4:6-tribromophenol and trinitrophenol, respectively. An ether extraction via Soxhlet Thimble was used to remove all other soluble materials, then the dried salts' were extracted with alcohol to recover the sodium salts of the fatty acids. These salts were dried and treated with dry phosphoric acid and distilled in vacuo at 20 mm. absolute pressure, yielding a water-white mixture of acids. The weight of acids recovered was equivalent to 779 p.p.m. of the original water sample. An electrometric titration method was used also to determine organic-acid content, calculated as propionic acid.

Exposure of samples of condensate water to air alone, without heating, causes a large drop in pH of the water, P. H. Menaul stated in discussing methods for treating wells for corrosion. One sample showed a pH reduction from 5.7 to 4.8 on exposure to air, and the addition of 1 ml. of neutral hydrogen peroxide reduced it further, to 3.1. This reaction Menaul found to be characteristic of ferrous salts of organic acids, such as ferrous acetate. This researcher recommends the conversion of ferrous to ferric organic acid salts and electrometric filtration to determine the organic acid content of the water. An analysis of the water of well showing corrosion is made and by the use of a special injection apparatus the required amount of chemical is injected into the casing annulus when producing through the tubing, a method which has solved the corrosion problem for his company, Menaul said.

Southern Oklahoma Wells Shut Down by Strike

Production was shut down early this week on the Wirt Franklin Petroleum Co. properties in the Healdton district of Carter County, according to the district spokesman of CIO Oil Workers' Union.

Employes walked out on strike when union-management conferences held in Dallas ended in a deadlock. Eighty-four wells were affected. The stiuation did not apply to other production in the area.

In Houston, Tex., members of the Houston Engineers Club voted unanimously against unionization of professional engineers after attempts were made by the American Federation of Labor to organize engineers, draftsmen and allied workers.

In New York City negotiators representing the CIO Oil Workers' Union were reported to have reached an agreement with Sinclair Refining Co. and its subsidiaries, after a 15-day conference. If Sinclair ratifies the agreement, the proposed contract goes into effect June 1 for one year.

Texas Recovery Projects Get Commission Approval

AUSTIN, Tex. — Pressure maintenance, repressuring, and water-flooding operations in six Texas counties were authorized by the Texas Railroad Commission in recent orders.

Pressure maintenance operations will be conducted by Sun Oil Co. on its Weil lease, Weil field, Jim Hogg County. Casinghead plus possibly other gas produced will be collected, compressed, and injected through 11 Weil.

In the Richard King field, Nueces County, Southern Minerals Corp. will repressure with gas the upper 5,400-ft. "A" sand. Casinghead gas from that sand will be augmented by gas produced from the C-17 King gas well which produces from a 5,000-ft. stringer gas sand.

Gas repressuring by George D. Morgan, trustee, and Con-Tex Petroleum Corp. has been authorized by the commission for the Alexander Trust estate lease, Jones County. Casinghead gas from the Bluff Creek sand is to be injected back into that formation at an injection pressure of from 380 to 470 psi., through 4, 11, and 15 Alexander Trust estate wells.

Trumter Petroleum Corp. has been granted permit to repressure by gas injection the 700-ft. formation on its C. W. Walterscheid lease, Cooke County.

Texas Pacific Coal & Oil Co. has been given a permit to water flood the Strawn sand at a point opposite a 1,575-ft. section and a 1,625-ft. section found in its 27 A. D. Hohhertz well on its lease in Stephens and Palo Pinto counties.

International

WORLD-WIDE OIL DEVELOPMENTS

Phillips' Wild Well in Venezuela Under Control

BARTLESVILLE, Okla.—A wild oil and gas well located on the 25,800-acre concession held by Phillips Venezuelan Oil Co. in eastern Venezuela has been successfully brought under control, Phillips Petroleum Co., parent company, announced at its headquarters here.

There was no fire nor were there any injuries, Phillips officials said. No damage was done to the oil reservoir, they added.

The well has an estimated 375 ft. of net oil and gas-bearing sands. The large well opens up a new pool in eastern Venezuela. Two additional offset wells are already drilling, and operations are being pushed as rapidly as possible anticipating a large drilling program.

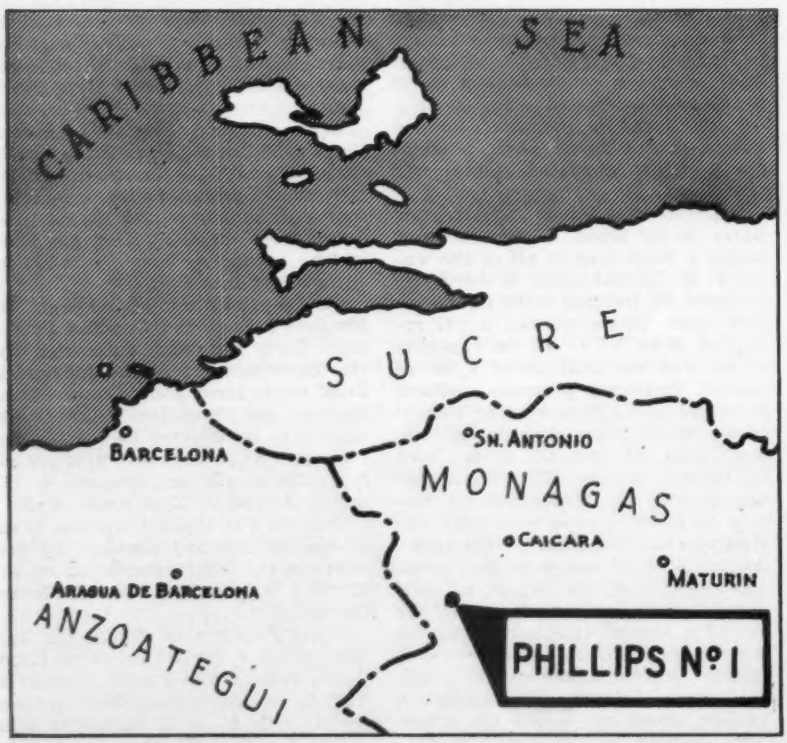
According to reports to the company here, the well went out of control early last week and was flowing an estimated several hundred barrels of oil a day with 50,000,000 cu. ft. of gas. Earlier, casing was cemented through the oil and gas zone. The well started unloading while the perforating gun was being removed and after perforating the casing opposite a 20-ft. section.

A flow test was to be made soon on the well. It is in the Malta Grande exploitation concession in the state of Monagas, Venezuela.

Thick oil-bearing sands with promising indications of prolific production have been found. The well is near and in the trend of the Jusepin-Santa Barbara fields which comprise the largest oil reserves discovered to date in eastern Venezuela.

Gas was found at 4,581 ft. and the first oil sand was encountered at 4,706 ft. An oil and gas zone of 600 ft. gross thickness was penetrated. The gravity of the oil ranges from 35° (A.P.I.) in the upper portion to 25° (A.P.I.) in the lower portion.

Plans for additional wells on this block are now under way, according to the company's first quarterly report for 1946 which also states that exploration is progressing satisfactorily on the remainder of the company's acreage in eastern Venezuela, with test wells scheduled for this acreage at an early date.



Map showing location of the Phillips which was recently brought under control

Oil Law Revisions Expected To Encourage Exploration

SARNIA, Ont.—Large scale oil exploration in Colombia and Peru is expected to be encouraged by modification of existing concession laws in the two countries, L. P. Maier, president of International Petroleum Co., Ltd., told stockholders in the company's annual report.

Maier pointed out both Colombia and Peru have appointed special commissions to study and recommend reforms in their petroleum codes. International has extensive holdings in Venezuela, Colombia, Ecuador, and Peru.

"Present indications are that world prices for crude oil will be highly competitive, and sales from the production of any particular country will be directly affected by the burdens imposed on the industry by that country," the report said. "Your directors . . . believe that in each country those concerned are aware of the effect which their actions may have on the revenues derived from the oil industry."

Summarizing operations in South America, the report disclosed International's gross production in Peru during 1945 was 11,278,387 bbl. A total of 83 new wells were completed in the country, and 51 wells deepened. Development wells in Peru totaled 73 of which 66 were productive, and 10 exploratory wells were completed of which two were productive.

In Colombia, International's gross production during 1945 was 15,273,633 bbl. Drilling activity increased during the year, and 26 new wells were completed on the De Mares concession. Development wells totaled 24 of

which 21 were productive, and two exploratory wells both were productive.

Reporting on operations in Venezuela, the report said the volume of crude from International's 25 per cent interest in the operation of Mene Grande Oil Co. during 1945 totaled 14,905,799 bbl., made up of gross production of 13,356,789 bbl. and purchases of 1,549,010 bbl.

In Ecuador, International Ecuadorean Petroleum Co., 60 per cent owned by International Petroleum, drilled three nonproductive exploratory wells. The report said the company is continuing with three strings of tools to complete the testing of the 4,625,060 acres held in the coastal area of Ecuador.

N.E.I. Oil Awaits Settlement Of Postwar Political Problems

PART 2

OIL production in Java, so far, has been restricted to a relatively small area on the northeastern part of the island. About a dozen fields have produced 108,000,000 bbl. of oil, the most important being Kawengan, Ledok, Nglobo, and Lidah-Kroeka. Most of these fields are moderately steep asymmetrical anticlines generally intersected by normal faults. The oil is derived from sandstones associated with a section of marls of upper Miocene age, ranging in depth from 700 to 3,000 ft. In contrast with the producing sands of Sumatra and Borneo, these sands are rather persistent, and the fields are predominantly of the water-drive type.

The oil of most east Java fields is paraffinic with gravities from 35° to 45° A.P.I. The paraffin content can change from one field to another from less than 3 per cent to more than 13 per cent within the same producing zone. The Lidah-Kroeka field, unlike the others, is characterized by relatively heavy asphaltic oil (25° to 35° A.P.I.). Production here is obtained from the top part of the upper Miocene marls and from irregular sands within the superimposed Pliocene clays.

General Geology

The island of Java is not as regular structurally and stratigraphically as Sumatra, and it may lie largely in a different Tertiary geologic geosyncline. Although the core of the island is geanticlinal, only a few very small areas of pre-Tertiary strata are exposed, probably in part because of the late Tertiary and Quaternary volcanics, and in part because of lesser uplift and erosion.

The Java geanticline chiefly exposes Miocene strata and, like Sumatra, is bordered on the north by a geosyncline. The deeper and wider part of this geosyncline lies on the northwestern end of that island. The shallower parts of the Sumatra and Java geosynclines, therefore, are adjacent to the "buried" extension of the Malay Peninsula around which the island arc is bent.

In west Java the Tertiary section along the north coast is on the order of 9,500-10,500 ft. thick and is chiefly marine except near the top. The geosyncline is probably asymmetric, as in south Sumatra. In this region, young, horizontal, unconformable Plio-Pleistocene strata cover a great part of the area in which oil possibilities are believed to be present, and geophysical surveys are necessary to obtain clues to the underlying structure. Surface oil indications occur in west Java and some good showings were found in wells drilled near Cheribon.

In east Java the exposed section and that penetrated in wells totals 10,200-12,000 ft. but is probably much thicker. It is composed chiefly of marine marls and shales which have remarkably few porous beds. Sands are generally rare except locally in the upper part of the section, and limestones are also limited when the great thickness of marine sediments is considered. The section is apparently conformable except for a single unconformity in the Pliocene around and over the Rembang-Madoera geanticline which lies close to the north coast. Stratigraphic-trap possibilities have not been investigated.

No oil has been found along the south coast of Java although a few gas seepages are known to occur. This area is underlain by a thick series of Miocene and Pliocene marls, clays, limestones, and volcanics.

Borneo

The island of Borneo may be divided into four areas:

1. Balikpapan area in southeast Borneo.
2. Tarakan area in northeast Borneo.

3. Miri-Seria area in northwest Borneo.
4. Barito area in south-central Borneo.

Areas 1 to 3 include the oil fields of Borneo which had produced, at the time of the occupation, nearly 500,000,000 bbl. of oil. Area 4 is not yet producing, but commercial oil accumulation has been discovered.

Balikpapan area.—Oil was discovered in this area in 1898, and until the end of 1940 almost 240,000,000 bbl. of crude were produced. Although this area has contributed more than 20 per cent of the total production of the Netherlands East Indies, the main fields, Louise and Sambodja, are on the decline, and the Balikpapan area's share of the total N.E.I. 1940 production was only about 10 per cent.

Practically all producing structures are part of one huge anticlinal trend, situated between the coast and the highly upfolded, complicated structures of the Meratoes Mountains. These producing structures are moderately steeply folded, are complicated by cross faulting, and are characterized by steep western flanks. Oil is found in sands of upper Miocene and Pliocene age. About 10 different sands are producing, the deepest at about 2,500 ft. At shallow depths, these sands contain heavy asphaltic oil; downward, the oil becomes lighter and more paraffinic. The character of the oil seems to be primarily a function of the subsea depth of its occurrence and not of its stratigraphic age. In Louise, sands which produce heavy asphaltic oil near the top of the structure produce light asphaltic oil down dip, or in downfaulted blocks.

Tarakan area.—This area includes the embayment that lies north of the Mangkalihat Peninsula. It includes Tarakan Island which has produced practically all the oil in northeast Borneo. The backbone of this island is formed by a huge anticlinal structure, on which four dome-like closures are known to contain oil accumulations.

By far the most important field is Pamoesian, with a producing area of about 1,100 acres. The Djoewata field produces from about 40 wells while the remaining two domes were hardly commercial. These fields, although covering an area of only about 1,300 acres, have produced almost 144,000,000 bbl., or about 110,000 bbl. per acre. During 1941 the daily rate of production was 13,600 bbl. The producing formation is Pliocene and upper Miocene in age and consists of an alternation of sands, conglomerates, sandy clays, and clays with nu-

merous beds of lignitic coal. These coals are persistent and make good markers.

Pamoesian is a rather gentle structure, broken by some normal faulting. Fifteen producing sands have been proved so far, of which the upper 12, at depths from approximately 180 to 1,500 ft., are responsible for the bulk of the oil produced. They are characterized by heavy asphaltic oil of about 18° A.P.I. which can be used directly as a fuel or low-grade diesel oil.

The three deepest sands (2,400-3,700 ft.) contain a lighter paraffinic oil. Many of the producing sand bodies are thick, and in their lower parts, as a rule, contain salt water over the whole structure. A relatively strong water drive can be observed, and the bottom water tends to cone. Each layer, therefore, has to be produced separately and it is the practice to penetrate the oil sands only 20 to 30 ft.

At the time of the destruction of the field before the Japanese invasion, 5 wells were flowing, 30 were producing by gas lift, and the remainder were pumping. Due to the rather advanced stage of depletion reached by this field for the shallow asphaltic oil, water contamination was a serious problem. Most of the oil, however, separates easily from water.

Miri-Seria Area

Production in this area began in 1913 and until the end of 1940, more than 100,000,000 bbl. were produced. Oil is derived from two fields, the Miri field in northern Sarawak and the Seria field in southern Brunei.

Miri was discovered in 1911, reached its peak in 1929, and is now approaching the depletion stage. At the time of the invasion (September 1941) it was producing about 3,000 bbl. daily from 350 pumping wells. This field is associated with a rather complex, highly faulted, asymmetric anticline. The southeast flank is steep and complicated by thrust faulting.

Seria, 25 miles north of Miri, was discovered in 1928. Up to the time of the invasion; besides 11 offshore wells, 140 wells had been drilled in an area 5 miles long and ¾ mile wide. The field at this time had a daily potential exceeding 43,000 bbl. (25,000 bbl. light oil, 18,000 bbl. heavy oil). Production limits were only partly established, and the field represents some of the largest known reserves in the East Indies.

The Seria field is located on a large east-west-trending anticline, the axis of which lies offshore in the South China Sea. The south flank is complicated by steep dips, normal longitudinal faults and transverse faults. Heavy asphaltic oil of 19° gravity is produced at shallow depths (500-2,000 ft.) from the Seria formation.

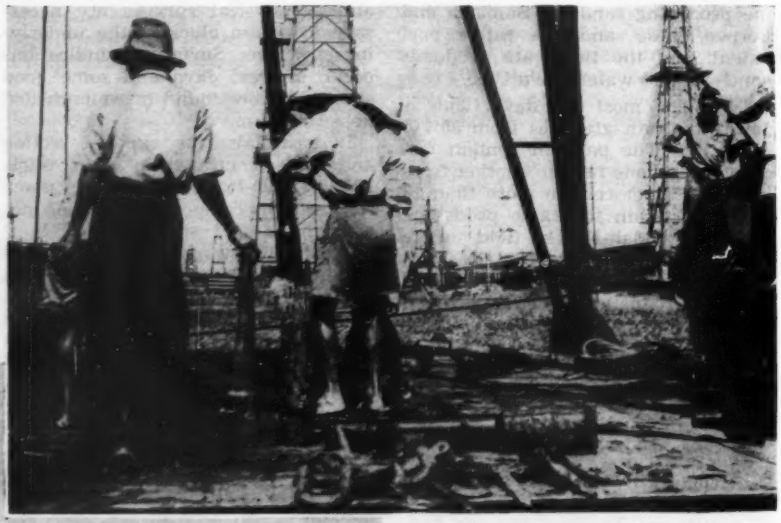
This formation, upper Miocene in age, has a thickness of 2,500-3,300 ft. and consists of alternating sands, sandy clays, and clays. It is underlain by the Miocene Miri formation, characterized by harder clays with sand intercalations. Somewhat more than 3,000 ft. of this formation has been explored so far. Its sandy zones contain paraffinic oil of about 32° gravity, which is produced by natural flow.

The field is divided into separate reservoir units by the two systems of faults. The size of the gas caps and of the oil-bearing parts of each sand layer may vary considerably from fault block to fault block. Production by depletion appears the universal characteristic.

Barito area.—This area is situated in the broad valley of the Barito River west of the Meratoes Mountains. Oil was discovered in commercial quantities on two structures approximately 100 miles upstream from the harbor town of Bandjermassin. This discovery is of special interest as the producing sands of these structures are Eocene in age, while elsewhere in the East Indies all production is from Miocene or Pliocene beds. The oil is of medium type, and paraffinic to heavy paraffinic.

General Geology

Topographically and structurally Borneo is a complicated island and a submergence of about 200-300 ft. would result in a radiating system of mountain chains separated by gulfs, like the island of Celebes. Borneo has a regional position similar to that of Sumatra in that it borders



Above: Experienced personnel from the Netherlands Indies training camps in Australia at work on liberated oil wells on Tarakan. These men are members of the technical corps of the Royal Netherlands Forces

Left: Reconstruction work being carried out by employes of Military Oil Rehabilitation Service of damaged installations on Pamoesian oil fields. (Official Netherlands photos)

and includes part of the foreland of Asia. During the Eocene and Oligocene thick terrestrial sediments and volcanics were deposited around the foreland in west, central, and southeast Borneo, and marine deposits, chiefly shales, limestones and sandstones, all extremely thick, were deposited in central and east Borneo where a great embayment persisted throughout most of Lower Tertiary time. At the beginning of the Miocene marine strata became more and more interbedded with fresh-water deposits containing coal beds, which increase upward until, in the Pliocene, practically the entire section consists of terrestrial deposits, except in the Sankoelirang Bay-Mangkalihat region where the Pliocene is composed chiefly of clays, marls, and limestones.

During the late Miocene, uplift began along the western border of the geosyncline, also in the regions now occupied by the Meratoes Mountains of southeast Borneo and by the Mangkalihat Peninsula. These uplifts divided the geosyncline into three embayments in which deposition continued until the late Pliocene, when the uplifting began that produced the several radiating mountain ranges of Borneo and folded and faulted the intervening geosynclines. Only gentle folding and faulting occurred in the shelf areas near the foreland, whereas steep folding took place in the central parts of the basins where the sections are very thick.

New Guinea

So far only one Tertiary basin on New Guinea has been evaluated as to its oil possibilities. This basin covers the southern part of the Vogelkop (Bird's Head) which is the northwesternmost promontory of this island. Stratigraphically and structurally the Vogelkop is the most attractive part of New Guinea. The Tertiary section is thick and well exposed; numerous structures occur; and oil indications are present in several parts of the section.

Exploration was started in 1937 in the Vogelkop basin and, at the time of the Japanese invasion, oil had been discovered on three structures; Klamono in the western, and Wasian and Mogoi in the eastern part. These discoveries prove that this large basin (about 200 miles long and 40 to 70 miles wide) offers possibilities for the development of substantial production. It is interesting that these structures are the only ones in the entire archipelago where oil is produced from limestone and not from sands.

Klamono.—Fourteen shallow wells have been drilled on this structure. Eight of these were productive, averaging 1,400 bbl. I.P., and proving an area of about 400 acres. The oil is asphaltic, 18.8° gravity, and can be used as a fuel after a light flashing-off process.

Klamono is a broad dome-like anticline with flank dips of 5° to 10°, broken into blocks by two systems of normal faults. Numerous oil seeps are present in the axial part of the structure. The top of the porous limestone pay is found at depths as shallow as 300 ft. near the top of the structure. A uniform, horizontal water table is indicated throughout the different fault blocks with a saturated limestone section up to 400 ft. thick above it.

Wasian and Mogoi.—At Wasian two wells were drilled and both found oil in the top of a limestone section of Miocene age at 3,100 and 3,225 ft. The daily production rate of the second well was 2,400 bbl. No conclusive test was made in the first well which was drilled to about 9,000 ft. The oil is paraffinic and has a gravity of 47.6° A.P.I.

At Mogoi, the Miocene limestone was reached at 1,873 ft. in the only well drilled on this structure. According to a preliminary rating this well was good for about 600 bbl. daily.

The Wasian and the adjoining Mogoi anticlines are in the eastern Vogelkop and are part of a 60-mile-long belt of anticlines which trend northwestward. Both structures are rather gentle with flank dips of 5° to 20°, and are closed at the surface in a predominantly shaly section of Pliocene age. Mogoi is slightly steeper than Wasian, and has a steep zone in the northeast flank.

Ceram

Outside the large islands of Sumatra, Java, Borneo, and New Guinea, only one field has been developed in the East Indies Archipelago. This is the Boela field in the easternmost part of the island of Ceram, which lies between Celebes and New Guinea.

This small field was discovered in 1913 and had produced about 7,500,000 bbl. to the end of 1940. The Boela oil is found in shallow Plio-Pleistocene sands at depths of 200 to 1,000 ft., is a heavy asphaltic type, about 22.5° gravity.

No maps, except large-scale maps and sea charts, were available for most of the area of the East Indies Archipelago for many years. Shortly before the invasion, however, the Nederlandsch Nieuw Guinea Petroleum Maatschappij photographed the entire area on a scale of 1:40,000 (1 in. equals 3,333 ft.). Topographic maps made from these pictures at the same scale formed the base for all further exploration activities. Besides this, systematic stereoscopic studies of the pictures were made, which made it possible to outline the following areas:

1. Areas of swamps and lowland without outcrops.

2. Flat areas more or less unfolded or covered by terraces.

International

WORLD-WIDE OIL DEVELOPMENTS

3. Areas gently to moderately folded. Most of the anticlinal structures could be outlined in a general way; faults and areas of culminations of the anticlines could be located.

4. Areas of steep, highly-upfolded structures.

With this information at hand an efficient planning and organizing of the geological exploration work was possible. This is of special importance in a region where each field party means organizing and fitting-out of a small-scale expedition into more or less unknown jungle country.

Areas of the first two types had to be explored mainly by geophysical methods such as gravity and seismograph. The third, generally speaking, represents the area of favorable Tertiary structures (like Klamono, Wasian, and Mogoi), while the fourth type predominantly belongs to the geanticlinal part of the basin with pre-Tertiary anticlinal cores.

Wildcat on Sinai Peninsula Shows for 275 Bbl. Daily

CAIRO, Egypt.—A flow test recently made on Anglo-Egyptian Oilfields, Ltd.'s wildcat, SUDR, on the east coast of the Sinai Peninsula, about 40 miles south of Suez, indicates a daily production of approximately 275 bbl. of 22° A.P.I. gravity crude, according to a company official. Further testing is in progress.

Since March 19, when Anglo-Egyptian first announced success of its wildcat here, the well was drilled from 2,700 ft. down to 3,157 ft. and plugged back to 2,925 ft. A short pumping production test was made on the interval 2,680 to 2,925 ft.

This well was drilled in partnership with Socony-Vacuum Oil Co., Inc., and each partner will share equally in the production. Anglo-Egyptian is a Royal Dutch-Shell interest.

Output of Three Mexican Fields Gains in February

MEXICO CITY. — Daily average production of three Mexican fields, Poza Rica, Naranjos, and Panuco, showed a substantial increase in February.

Output during the month was 108,228 bbl., compared with 97,991 bbl. in January. February's total production was 3,030,183 bbl. Stocks in the fields and at terminals in the northern zone totaled 3,998,415 bbl. at the end of February.

WASHINGTON WATCHING

BY HENRY D. RALPH

Present Status of OGD

WASHINGTON.—The new Oil and Gas Division of the Interior Department is, for the present, just that—simply a small bureau in a big department. It can't do much except ride herd on petroleum policies of other Interior bureaus and make requests or suggestions to other departments.

But some officials in Interior hope that sooner or later OGD will turn into or become a part of an interdepartmental Cabinet-level oil board concerned primarily with long-range policies regarding the importance of oil in national defense.

A "Petroleum Security Board" is what some of these officials would call it. They say it should function to assure adequate petroleum supplies for national defense, taking a broad, long-range, national viewpoint.

Their reasoning is that there is a lot of confusion over whether or not we are running out of oil. Some people say we have only 12 years' supply, while others say that oil yet to be discovered, plus substitutes and synthetics from coal, gas, shale, tar sands, and alcohol will assure us unlimited supplies of liquid fuels for many generations. The conclusions of these officials is that the future oil supply of the United States is so uncertain as to require that we adopt and follow a comprehensive "petroleum security policy."

This policy, in the view of these Interior officials, should start out with these assumptions: Peacetime civilian demands for petroleum products are likely to expand rapidly and probably will keep crowding uncomfortably close to new discoveries, leaving little excess crude productive capacity for use in an emergency. Another war would require tremendous amounts of petroleum, far more than could be taken away from the civilian economy even with the strictest rationing, so national security requires that we maintain a large reserve capacity. Synthetic oil from coal and shale might meet peacetime demands but would require so much manpower that they could not be relied on as a military reserve for wartime use. The task of filling growing peacetime demands and at the same time building up a war-potential reserve is too great for the oil industry to handle by itself, so state and federal governments should team up with the industry to do the job.

Here are some of the planks which these officials think should be in our petroleum security policy:

Joint industry-government development of Alaskan oil, possibly (for defense reasons) using Alaskan oil during peacetime and saving reserves in the interior of the continent for military contingencies.

More and better state conservation laws designed to encourage discovery but prolong productive capacity, and especially fostering more conservation and better use of natural gas.

An extensive industry-government program of research on problems of secondary recovery, effective extraction, and preservation of stripper wells; also more research on synthetic and alternative liquid fuels.

Exploration of the Continental Shelf and development of methods for tapping submarine oil fields.

Treaties with other nations of the Western Hemisphere under which these countries would explore for oil, adopt conservation practices, maintain crude reserves, and build pipe lines and refineries so that the oil would be available for common defense of the hemisphere in event of another war.

Seek Chief for OGD

ORGANIZATION of the Interior Department's new Oil and Gas Division and its advisory National Petroleum Council is proceding slowly. As yet there is no determination on the size of the division nor who should head it. An effort is being made to find a division chief outside of the department, someone who knows the oil and gas industries and who also has had some government experience.

Ralph K. Davies, former deputy petroleum administrator, is busy with organization and personnel plans, but he has no intention of becoming a member of the crew after he gets the ship launched. It was with reluctance that he permitted department people to refer to him as "acting director" of OGD, as he feared this designation would create the impression that he might stick around.

One of Davies' problems is to fit his ideas into the framework of a regular bureau of an old-line agency. In PAW he had a virtually unlimited budget from emergency funds, was not much restricted by civil-service rules in placing personnel, and could draft capable men from industry for war service. Now he is restricted to budget estimates which stand a reasonable chance of being approved by Congress in a deficiency appropriation bill—and at a time when Congress is romping all over the department's regular appropriations.

Davies feels that the new division, to do the job he has in mind for it, will need a fair-sized staff of experts because it will not be able to borrow the services of industry men to the extent PAW did during the war. But government salaries for the grades which the Civil Service Commission establishes for scientists and subexecutives are not high enough to attract many top-notch, experienced men from the industry.

It is planned to offset this weakness by industry representatives who will be asked to serve on the National Petroleum Council and various standing and special subcommittees, just as the PAW staff dovetailed with its industry committees and PIWC and its committees. However, this isn't exactly the orthodox way of running a regular government bureau in peacetime. Government methods of procedure (i.e., red tape) are so different from industry's ways of getting things done that it will be difficult to get this team to work well in double harness, even without the ever-present antitrust laws maintaining a close rein on what the industry committees may do.

Interior Draws Fire

THE slowness of the Interior Department in getting anything done drew fire from several quarters in Congress last week.

The House appropriations committee, in slashing the department's budget almost in half, took a poke at what it termed the "inefficiency and gross extravagance in certain agencies of the department," and during its hearings on this bill several committee members roundly criticized various bureau chiefs for letting huge backlogs of work pile up without action.

The stereotyped answer was, of course, that Congress has not appropriated enough funds to let the department hire enough men to keep its work current, but that didn't satisfy the congressional critics. They suggested that instead the department make a try at cutting out a lot of red tape, eliminate paper work, reduce the amount of investigating

and pondering, and make decisions more quickly. They even charged that the department officials are making more work for themselves by assuming discretionary powers which the laws did not contemplate, and suggested that routine matters should be disposed of in a routine and expeditious fashion without lengthy investigations and correspondence on technical details.

The General Land Office was singled out for special chastisement at hearings before the House committee on public lands in connection with the Fernandez bill to liberalize the general leasing act. Several congressmen jumped all over GLO for delays in issuing oil and gas leases, approving of lease assignments, and passing on other documents. They really were pretty rough.

In a much nicer way the Land Office was given a similar lecture at the Senate public-lands-committee hearing on a companion bill. The senators were very gracious, but they listened smilingly while industry witnesses testified—in mild and polite language—that administration of the leasing laws should be simplified so as to avoid the current delays in getting action out of the GLO. They advocated giving less discretion and less regulatory powers to the department in the interest of expedition, and they made factual but telling explanations of the length of time it takes the department to act on any application and the increased volume of work which the department is inviting for itself in the amendments it proposes to the leasing laws.

All in all, the Interior officials had a pretty rough week.

Interior's Vacancies Filled

SECRETARY KRUG finally has filled the vacancies in the top Interior posts. President Truman last week nominated Warner W. Gardner of New York to be assistant secretary of Interior, filling the post left vacant months ago when Micael W. Straus stepped down to the more permanent job of commissioner of reclamation. He also nominated C. Girard Davidson of Oregon to the other assistant secretaryship which was vacated when Oscar L. Chapman was elevated to undersecretary.

Gardner was formerly solicitor of the department and Davidson was general counsel of Bonneville Power Administration.

Thus both the new assistant secretaries are promoted from within the department, both are lawyers, both are familiar with the way the department has been operating, and both are "Ickes holdovers." The same can be said about Undersecretary Chapman.

This policy of promotion from the ranks has both good and bad points. It leads to continuity of administration and helps the morale of sincere government-career men who see a chance for advancement as a reward for efficient service. On the other hand, the "new-broom-sweeps-clean" school of thought likes to see new blood brought in at the top to clear out bureaucratic deadwood. Certain members of Congress, particularly, would have preferred that these posts be filled with deserving politicians from western states, such as ex-governors or congressmen.

Krug's selections should increase his popularity with his staff and make for harmonious administration, but they will make it more difficult for him to introduce sweeping reorganizations and reforms in administrative procedure if that is his objective.

Shades of Harold Ickes

SECRETARY KRUG is going to have a tough time breaking down the thought habits of the bureaucrats he inherited with 13 years of Ickes indoctrination.

This was evident from his testimony before the Senate public-lands committee on the Hatch-O'Mahoney bill to liberalize the general leasing act. Krug came with a prepared statement which defended the department's long-standing opposition to most of the bill's provisions. Undoubtedly the statement was prepared for him by the lower echelons; this is standard operating procedure in the government, and, besides, he has not been on the job long enough to become completely familiar with all details.

However, Krug skipped a couple of paragraphs, explaining that he didn't care to make an issue of certain points and that the department is changing its views on others—suggesting that when his subordinates "briefed" him for his appearance he didn't go along with them completely.

Then the committee began to question the secretary on some of the details of the department's position and his reasons therefor. Krug did the best he could to defend the department's position but at times he didn't sound very convincing, and he finally broke down and confessed to the committee that "the people in my department feel more strongly on some of these things that I do." He left the impression that he, personally, would not fight the bill to the bitter end if the committee decides that the department's objections are without merit.

But after the secretary left the hearing the General Land Office spokesmen showed no disposition to compromise. They evidenced a conviction that their most important responsibilities, as trustees of the public domain, are to prevent overproduction of oil, to prevent monopoly and the concentration of economic power, and to get the highest possible monetary return for the Government's lands and the Government's oil. They fought against any provision in the bill which would lessen their authority and discretion. They asked the power to control all oil and gas transactions involving the public domain just to make sure that nobody puts anything over on anybody.

Shades of "Honest Harold" Ickes. He did his work well, and his spirit marches on in the interminable corridors of the Interior building.

Coal Strike Placed Heavy Demand on Fuel Oil

Though temporarily settled under Presidential pressure, the 42-day nationwide soft coal walkout left a number of serious effects on the oil industry.

The impact of the strike and the somewhat remote possibility of a further tieup after the 12-day truce came in the form of increasingly heavy demands for fuel oil and residual to replace coal as a power source, interference with the production of necessary refining chemicals, and further reduction of the supply of steel goods.

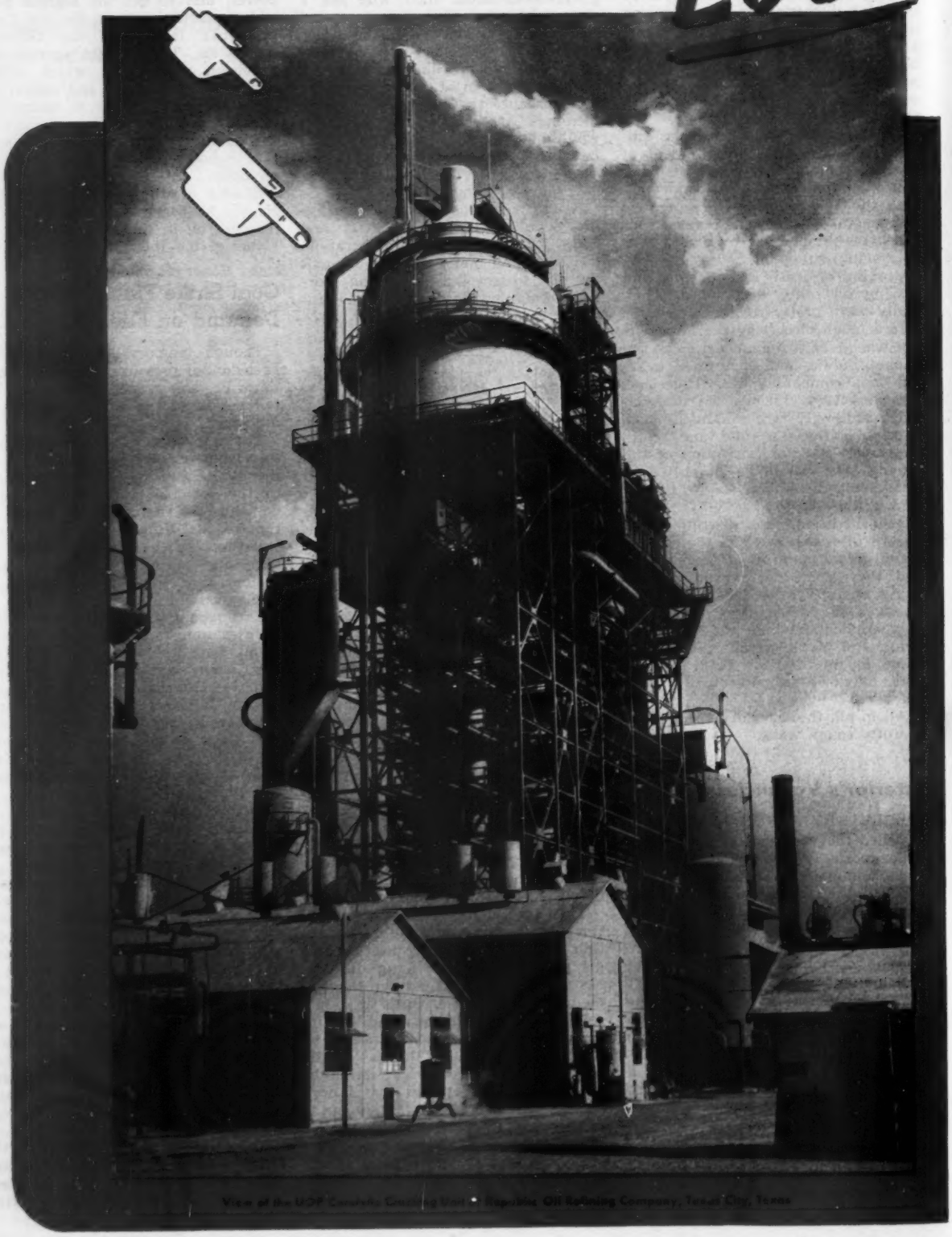
Throughout the country, industries, utilities and railroads were turning to oil. Late last week, Ralph K. Davies, acting director of the new Oil and Gas Division in the Department of the Interior, asked 38 principal suppliers of residual fuel oil on the East Coast to make available a total of 75,000 bbl. daily to enable East Coast public utilities to operate standby equipment.

Lifting the railroad embargo at midnight Sunday enabled many refiners in the Middle West to breath easier and see ahead a supply of tetraethyl lead and other chemicals. Petroleum and its products were exempt from the embargo, but no provision was made for chemicals necessary for refining. It was considered likely some refiners would attempt to stock up on some chemicals to meet the possibility of another tieup.

The shortage of steel products, already acute as a result of the steel strike earlier in the year, threatened to curtail some oil industry operations. In the Fort Worth area, a survey of supply houses showed pipe particularly short.

The coal walkout, together with the steel strike, is estimated to have kept more than 10,000,000 tons of steel ingot from the market since the first of the year.

We point with pride to a LOSS



View of the UOP Catalytic Cracking Unit at Republic Oil Refining Company, Texas City, Texas

a catalyst loss of only 0.18 lbs. per barrel of charge

UNIVERSAL PROCESSES

UOP

Here are the new officers of the Petroleum Industry Electrical Association and the Petroleum Electric Supply Association which held its eighteenth annual conference last week in Tulsa. Left, are officers of the P.I.E.A.: sitting, R. C. Appling, superintendent of telephone, telegraph, and dispatching, United Gas Pipe Line Co., Shreveport, retiring president and new secretary-treasurer; center, J. F. Collerain, superintendent, telegraph and telephone, Houston Pipe Line Co., secretary-treasurer of the association since 1938 and new vice president; and M. C. Callahan, superintendent, telephone, telegraph and electrical department, Gulf Refining Co., Tulsa Pipe Line Division, former association vice president and new president. Right, are the officers of the P.E.S.A.: R. A. Breese, salesman, General Cable Co., Dallas, secretary-treasurer; Fred Cummings, commercial manager, Tulsa, Graybar Electric Co., Inc., association president; and E. C. Lyle, sales engineer, Houston, Westinghouse Electric Supply Co., association vice president

Power and Communications Advances Displayed at Meeting

WARTIME developments in the electric communications and electric power field and their application to the petrolem industry were described and displayed last week in Tulsa before about 300 members of the Petroleum Industry Electrical Association and the companion Petroleum Electric Supply Association.

At their 3-day eighteenth annual conference, members of the two organizations listened to a number of discussions of electrical developments, viewed some 40 exhibits of suppliers and manufacturers, elected officers, and chose Houston for the conference next year.

M. C. Callahan, superintendent, telephone, telegraph and electrical department, Gulf Refining Co., Tulsa Pipe Line Division, was elevated from vice president to president of the industry association. Fred Cummings, Tulsa commercial manager, Graybar Electric Co., Inc., was named to head the supply organization.

At the conference, the Petroleum Industry Electrical Association decided to resume publication in June of the organization's monthly magazine, Electrical News, which was discontinued last year. It will be published in Shreveport under the direction of Morris Chambers, retired former superintendent, telephone and telegraph, southern division, Interstate Oil Pipe Line Co.

Glen E. Nielsen, chief of the emergency and miscellaneous division, Federal Communications Commission, speaking on "Radio Facilities for the Petroleum Industry," explained the present status of allocation of frequencies and the many requests for frequency assignments now filed at Washington.

Outlining the many problems due to the number and variety of potential users, Nielsen said, "There are a number of other proposed new services which may provide certain communication facilities for the petroleum industry. One of these is the new general mobile radio service which provides two-way communication with various types of mobile units such as cars, trucks, harbor craft, etc."

W. H. Stueve, chief industrial consultant, Oklahoma Gas & Electric Co., Oklahoma City, in his paper, "Electric Power as Applied to the Oil Industry: Production, Pipe Line, and Refining," discussed informally, with the use of some 25 lantern slides, the percentage of prime movers which are electrified in different phases of oil work, ways of computing electric motor sizes for oil well pumping, drilling with electrified rotary rigs, and gave summarized observations as to a number of refinery and pipe line electrified installations.

An interesting paper of general concern was "Industry and Insurance Companies" by R. G. McCarthy, engineer with Marsh & McClennan, insurance brokers of Tulsa.

Daniel E. Nobel, general manager, communications and electronics division, Galvin Manufacturing Corp., Chicago, in "Radio Telephone Communications for the Petroleum Industry," described the equipment operations and usefulness of new service and equipment in the radio field for providing communication facilities in construction and operation involving field work and also as to fixed base or routine operations.

With "communications" the theme of the 3-day meeting, promising aspects of new and improved methods of handling communications also were described by H. P. Lawther, general transmission engineer, Southwestern Bell Telephone Co., St. Louis, in "Current Bell System Plans," which involve extensions of cable, broad band carrier, and radio systems, and C. E. Davies, general engineer, Western Union Telegraph Co., in speaking

on "Beamed Transmission, Teletype and Facsimile Communications."

Principal speaker at the annual banquet of the conference was P. H. Bohart, assistant to the vice president, Gulf Oil Corp., who emphasized the need for finding substantial new oil resources. His topic was "Oil and Tomorrow."

"Wars speed up developments, particularly of the newer mechanical appliances, and the application of newly discovered techniques," he said. "The use of the diesel engine was expanding before the war, but will receive far more rapid acceptance now. For one thing, those who depended upon coal before the present strike will find the idea of using diesels far more tempting than ever."

Bohart predicted demand will reach about 5,550,000 bbl. a day in 1948 with domestic output probably not exceeding 5,000,000 bbl. a day, including crude, natural gasoline and condensate. "New areas," he continued, "will be found, but how soon, how many, and of what size, no one knows. Reserves have been declining since 1930, so therefore I venture that we must go out and find new fields of from 500,000 to 1,000,000 bbl. a day."

Bohart expressed the view that fears many entertain of a flood of imports are not well founded. During the war, foreign oil shipments reached 412,000 bbl. a day, but the Southern American republics objected when it was planned to push them above 500,000 bbl. a day.

Keith Address Interests Natural-Gas Operators

CINCINNATI.—With more than 500 registrants the 2-day spring meeting of the Natural Gas Department of American Gas Association was brought to a close here May 8. On the final day special interest was manifested in the talk of P. C. Keith, president of Hydrocarbon Research, Inc., on "Gasoline from Natural Gas."

Keith, widely known for his contributions to refinery processing, has had an active part in the program to manufacture gasoline from natural gas. He is associated with a company which has plans under way for the construction of a plant in Southwest Texas.

Keith presented data on costs and yields in this new program in which part of the world's requirements for gasoline would be derived from natural gas.

In opening the second day's session, H. Carl Wolf, managing director of A.G.A., put particular emphasis on the natural-gas research program and spoke of the tools which would be used to bind industry cooperation, such as reliable statistics, rate analyses, and a better and more detailed knowledge of the market.

Among leaders of the gas industry who gathered in Cincinnati last week for the spring meeting of the Natural Gas Department of the American Gas Association were these two association officials, George H. Smith, natural gas department director, and H. Carl Wolf, managing director of the association

Speaking on "Trends in Industrial Relations," Fred R. Rauch, chairman of A.G.A.'s personnel committee, and manager of industrial relations for the Cincinnati Gas & Electric Co., warned employers not to underestimate the power of organized labor. He reminded the audience that as of today there is no law in the country to force responsibility on labor leaders, while, at the same time, employers can be penalized for "unfair labor practices."

William A. Dougherty, general counsel, Consolidated Natural Gas Co., scored the federal Government for its inconsistent decisions as to what constitutes interstate and intrastate transportation. He also hit restrictive natural-gas regulations.

J. Kenneth Salisbury, of the turbine-generator engineering division, General Electric Co., spoke on "Gas Turbines," and stated that while most turbines are now run on kerosene and other liquid fuels, and some coal, that they could be readily adapted to handle natural gas. The use of gas turbines in pipe-line pumping can be adapted to broad designs, he said. Additional reports on this meeting appeared in the May 11, 1946, issue of The Oil and Gas Journal, page 72.

Field Conference Planned

CASPER, Wyo. — The Wyoming Geological Association is planning its first annual field conference to be held in midsummer. Ross L. Heaton, Casper, is in charge of arrangements.

Reduction of Octane Rating Recommended

WASHINGTON. — A recommendation to reduce the octane rating on premium gasoline as a means of conserving the dwindling lead supply last week was offered by representatives of the petroleum refining industry at a conference with Civilian Production Administration officials.

The industry's recommendation called for a reduction from the 80-octane ceiling, currently permissible under the tetraethyl order L-355, to a 78.5-octane rate. It was thought that the octane reduction in leaded premium gasoline would not result in major changes in the industry.

The conference also discussed establishing an octane ceiling on regular or housebrand gasoline, but members offered no definite recommendation on this point, an announcement by CPA said.

However, officials of the CPA's chemical division indicated that based on information furnished by the refiners at this meeting it appeared likely that the L-355 order would be amended to include some reduction in the highest permitted octane content of leaded premium gasoline sold to users.

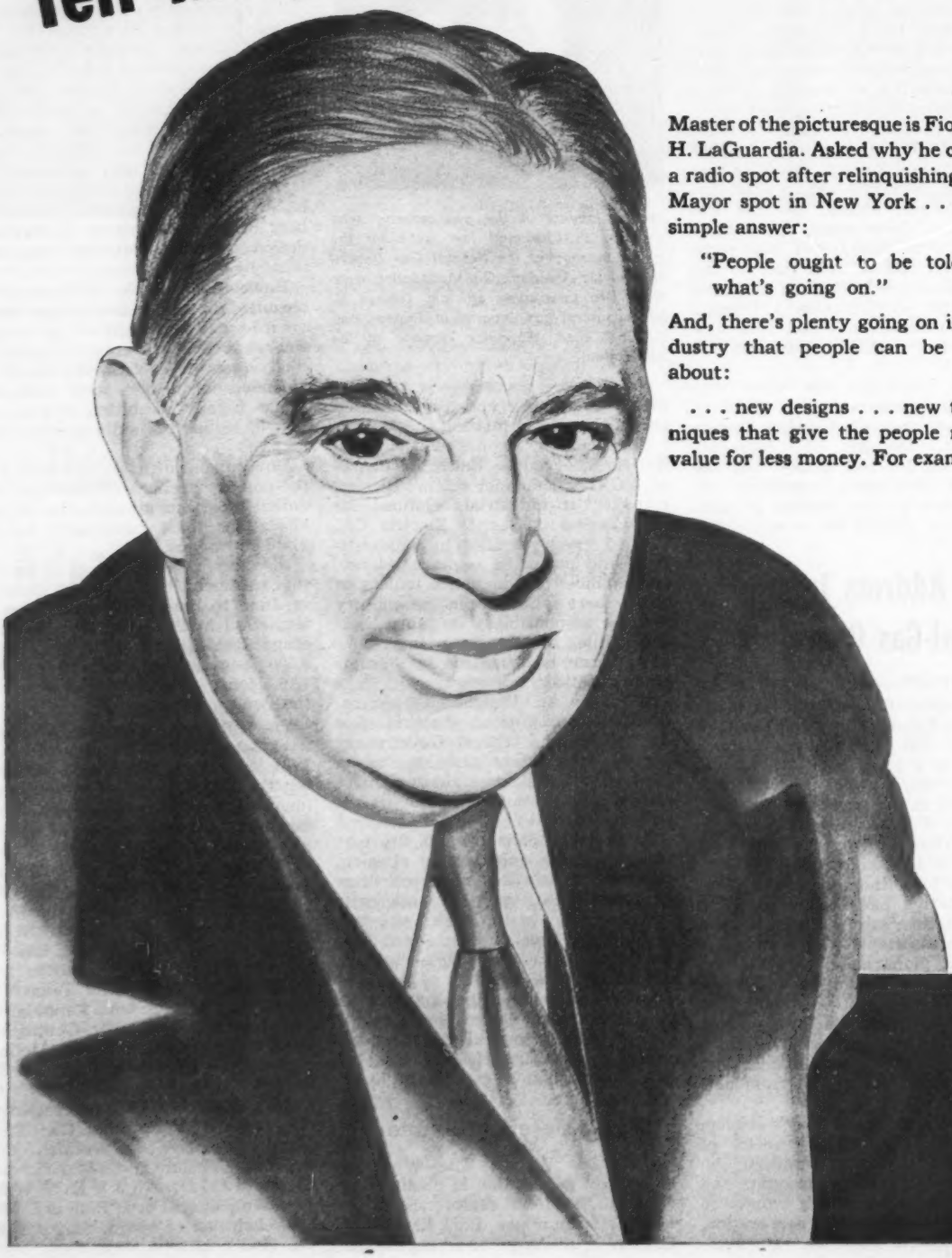
Government officials said that with the country facing a 200,000-ton lead deficit this year, all estimates of lead allocations must continually be revised downward.

However, the refiners were assured that sufficient lead would be supplied in June to maintain consumption of tetraethyl at the April and May average level. April allocations were 3,500 tons and May allocations were 4,160 tons; a 3,830-ton average for the two months.

The following industry representatives attended the meeting: Paul R. Beck, president, Pennsylvania Refining Co.; C. S. Bessemyer, vice president, General Petroleum Corp.; M. S. Beringer, vice president, British American Oil Co.; S. B. Eckert, vice president, Sun Oil Co.; J. B. Fisher, president, Kendall Refining Co.; Max M. Fisher, Aurora Gasoline Co.; A. P. Frame, vice president, Petroleum Advisers, Inc.; C. O. Garbrecht, Bay Petroleum Corp.; Walter Hochuli, general sales manager, The Texas Co.; W. E. Huston, president, Republic Oil Refining Co.; J. A. Lentz, Continental Oil Co., Denver, Colo.; N. J. McGaw, general vice president, Shell Oil Co., Inc.; B. L. Majewski, Deep Rock Oil Corp.; Howard Marshall, president, Ashland Oil & Refining Co.; T. N. Martin, executive vice president, Lion Oil Co.; Chester F. Smith, director, Standard Oil Co. (N. J.); E. W. Webb, president, Ethyl Corp.; Robert E. Wilson, chairman of board, Standard Oil Co. (Ind.)

then he said to himself:

Tell the people what's cookin'



Master of the picturesque is Fiorello H. LaGuardia. Asked why he chose a radio spot after relinquishing the Mayor spot in New York . . . his simple answer:

"People ought to be told what's going on."

And, there's plenty going on in industry that people can be told about:

. . . new designs . . . new techniques that give the people more value for less money. For example:

Special Charges Reduce 1945 Earnings

*by F. J. Sansone**

THE annual reports of 32 leading oil companies for the year ended December 31, 1945, show combined net income of $690,413,220, a decrease of $25,640,558 or 3.6 per cent from the record total of $715,053,778 reported by these companies in 1944.

Reflecting the attainment of new peaks in crude-oil production and refinery operations throughout the period up to the end of the Japanese War, oil-company earnings for the first 9 months of 1945 showed an average increase of about 15 per cent over the corresponding period of 1944. However, the decline in operations after the end of the war and the numerous special charges made against earnings in the final quarter by many of the companies more than offset the earlier gains with the result that aggregate reported earnings for the full year 1945 were lower than in the preceding year.

About half of the companies tabulated reported increased earnings last year. While the year-to-year comparisons of the various oil companies have always shown considerable variation due to differences in the character and scope of their operations, the aggregate figures for 1945 take in an unusually wide range of differences as a result of the combination of wartime, reconversion, and postwar operations.

The income accounts of many companies for 1945 were affected by accounting adjustments of sizable amounts which obscure a determination of actual operating earnings and impair the comparability of statements of the various companies for 1945 or even of the same companies for prior years. Some of these special end-of-war adjustments resulted in charges against income and some to credits to income, while others were carried directly to surplus account. In some instances, the manner of handling similar items differed among the various companies.

Of the variety of special adjustments, the following are more important examples:

1. Accelerated amortization of emergency facilities.
2. Present value of amortized war facilities.
3. Reconversion expenses and losses.
4. Elimination of reserves no longer needed.
5. Wartime losses of foreign assets.
6. Tax carry-back of unused excess profits credits.

Although the statements of a majority of the 32 companies included

*Carl H. Pforzheimer & Co.

With this annual discussion, the author submitted two additional tables, which are not published, but which will be sent on request to any reader of the Journal. One of these tables lists the assets, liabilities, financial condition, and capital of 32 oil companies for 1944 and 1945, and the other the earnings and dividends of the companies for the same years.

in this report were affected by one or more of the above noted adjustments, accelerated amortization of war facilities and related tax adjustments accounted for the bulk of the special charges and credits in oil-company income reports for 1945. This primarily reflects the great extent to which oil companies financed the construction of war-plant facilities out of their own funds as well as the absence of serious reconversion problems in the petroleum industry.

Amortization Deductions Increased

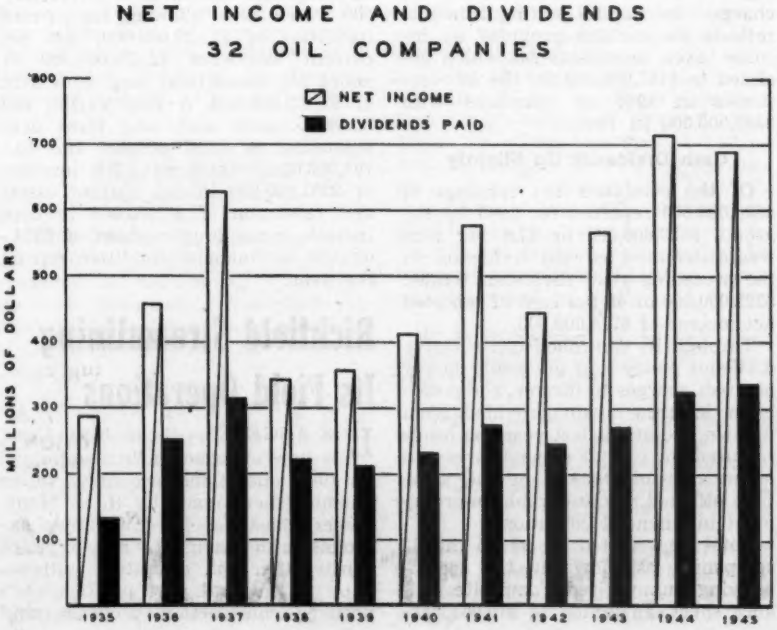
In order to bring about the great expansion of industrial capacity for war, Congress provided in 1942 that war plants and equipment constructed or purchased by private capital for war production, and certified by the Government as necessary to the war effort, should be subject to amortization charges of 20 per cent annually, over a 5-year period, or shorter in the event of the war ending sooner.

The presidential proclamation setting September 30, 1945, as the termination date of such amortization therefore permitted the recomputation of tax returns for former years, increasing the deductions for amortization, decreasing the amount of tax payable and giving rise to a claim for refund, and decreasing the net income after taxes. Most of the companies, however, instead of publishing a series of revised statements for prior years, simply charged the unamortized cost of war facilities as of last September 30, against 1945 earnings. This had the effect of reducing such reported earnings, except to the extent that these chargeoffs were absorbed by lower current tax reserves plus refunds of prior years' taxes.

Since much of the emergency facilities constructed by the oil industry was in operation for only about 3 years when the war terminated, unamortized plant amounted to several

EARNINGS AND DIVIDENDS OF 32 OIL COMPANIES—1935-1945

Year—	Net income	Cash dividends
1945	$690,413,220	$328,916,452
1944	715,053,778	322,420,022
1943	568,539,733	271,543,572
1942	444,812,059	244,053,844
1941	578,822,387	276,007,571
1940	412,157,371	231,415,557
1939	356,154,046	210,193,197
1938	341,083,662	220,897,663
1937	629,144,287	311,935,027
1936	458,820,512	251,625,745
1935	287,719,407	132,979,607



PRODUCTION AND REFINERY RUNS OF LEADING OIL COMPANIES IN 1945
(Thousands of barrels)

	Net crude production	Crude runs to refineries
Amerada Petroleum Corp.	18,090	.....
Atlantic Refining Co.	24,761	43,054
Barnsdall Oil Co.	9,952	.....
Continental Oil Co.	33,942	19,686
Gulf Oil Corp.:		
Domestic	74,014	106,615
Foreign	43,934	.....
Total	117,948	106,615
Humble Oil & Refining Co.	111,338	78,600
Lion Oil Co.	3,537	6,217
Mid-Continent Petroleum Corp.	5,683	11,838
Ohio Oil Co.	32,825	7,002
Phillips Petroleum Co.	34,223	28,092
Plymouth Oil Co.	4,765	.....
Pure Oil Co.	29,212	N.A.
Richfield Oil Corp.	8,634	25,691
Seaboard Oil Co.	8,229	.....
Shell Union Oil Corp.	69,275	102,540
Sinclair Oil Co.	*27,571	96,206
Skelly Oil Co.	12,683	10,461
Socony-Vacuum Oil Co., Inc.	†61,612	141,000
South Penn Oil Co.	4,222	.....
Standard Oil Co. of California	‡74,380	93,344
Standard Oil Co. (Indiana)	64,685	114,558
Standard Oil Co. (New Jersey):		
Domestic	§154,395	221,336
Foreign	§208,780	187,428
Total	§363,175	408,764
Standard Oil Co. of Ohio	7,545	27,153
Sun Oil Co.	27,112	57,444
The Texas Co.	‡86,439	123,661
Texas Pacific Coal & Oil Co.	4,408	.....
Tide Water Associated Oil Co.	32,361	58,483
Transwestern Oil Co.	4,989	.....
Union Oil Co. of California	26,380	41,246

*Does not include 10,600,000 bbl. produced in Venezuela by 65 per cent owned subsidiary. †Does not include interest in foreign production of approximately 10,000,000 bbl. ‡Does not include 50 per cent interest in production of Bahrein Petroleum Co. and Arabian American Oil Co. §Gross production. N.A.—Not available.

COMPOSITE INCOME STATEMENT AND BALANCE SHEET OF 32 OIL COMPANIES

Income account—	1945	1944
Gross operating income	$8,240,356,954	$8,328,933,209
Depreciation, depletion, etc.	1,018,232,123	827,082,065
Provision for income taxes	157,071,635	384,600,401
Net income	690,413,220	715,053,778
Cash dividend paid	328,916,452	322,420,022
Assets—		
Current assets	$3,798,589,060	$3,740,719,016
Property, plant and equipment*	5,971,634,581	6,015,764,998
Investments and advances	1,029,499,095	939,477,276
Miscellaneous other assets	164,047,118	177,498,046
Total assets	$10,963,769,854	$10,873,459,336
Liabilities—		
Current liabilities	$1,122,121,111	$1,361,497,254
Funded and long-term debt	1,184,256,125	1,191,210,013
Common stock	3,748,456,104	3,742,803,000
Preferred stock	154,609,900	212,870,582
Capital surplus	874,672,083	869,651,903
Earned surplus	2,989,236,142	2,564,840,768
Other liabilities and reserves	890,418,389	930,585,816
Total liabilities	$10,963,769,854	$10,873,459,336
Net working capital	$2,676,467,949	$2,379,221,762

*Net after reserves for depreciation, depletion, etc., amounting to $7,300,407,736 in 1945 and $6,585,627,211 in 1944.

hundred million dollars. The resultant substantial charges against 1945 earnings for accelerated amortization made by many of the 32 companies is reflected in the group's combined provision for depreciation, depletion and amortization which increased to $1,018,000,000 in 1945, or $191,000,000 more than in 1944. The reduction of only $25,000,000 in aggregate earnings in the face of this increase in charges for capital extinguishments reflects the cushion provided by income taxes, provisions for which declined to $157,000,000 for the 32 companies in 1945 as compared with $385,000,000 in 1944.

Cash Dividends Up Slightly

Of the combined net earnings of $690,000,000 reported for 1945 by the group, $329,000,000 or 47.6 per cent was distributed as cash dividends. In the preceding year, dividends totaled $322,000,000 or 45 per cent of reported net income of $715,000,000.

Through its continued conservative dividend policy and unusually heavy noncash charges to income, the petroleum industry again provided from its own operations last year the funds required for capital expenditures and other investments and at the same time effected a considerable improvement in financial condition.

Total depreciated assets of the 32 companies, as shown in the accompanying summarized composite balance sheet, amounted to $10,964,000,000 at December 31, 1945, an increase of $91,000,000 over the previous year end. The combined gross investment in properties, plant and equipment amounted to $13,272,000,000, against which there had been accumulated reserves of $7,300,000,000 for depreciation, depletion and amortization. The net investment in fixed capital assets of the group at the end of 1945 represented 45 per cent of the gross book value as compared with 47.7 per cent at December 31, 1944.

The combined current assets of the 32 companies amounted to $3,798,000,000 which, after allowing for current liabilities of $1,122,000,000, left net current assets at $2,676,000,000 or about 2½ times total long term debt of $1,185,000,000. A year earlier net current assets and long term debt amounted to $2,379,000,000 and $1,191,000,000, respectively. The increase of $297,000,000 in net current assets and reduction of $7,000,000 in debt indicate a net improvement of $304,000,000 in financial condition during the year.

Richfield Streamlining Its Field Operations

LOS ANGELES.—Richfield Oil Corp. is now engaged in "streamlining" its field operations, according to an announcement made by R. D. Montgomery, head of the company's exploitation department. This type of construction and alteration will occupy an integral part in Richfield's postwar construction program, and work is already under way in modernizing the present development at Signal Hill and in the Rincon area in southern California.

In the Signal Hill development, where Richfield is the second largest operator, 58 unsafe and unsightly wooden derricks will be razed and the wells will be equipped for pulling with a portable mast. Wells which are inaccessible to the mast will be equipped with steel derricks and will be pulled with a portable hoist. Seventy standard front-end pumping-equipment rigs will be replaced by modern pumping units, and wherever possible, tanks will be rearranged to permit commingling of production, thus minimizing the number and size of tanks.

The project will be landscaped to take full advantage of the natural surroundings, the storage tanks placed in inconspicuous spots, and the entire Richfield development area cleaned up and streamlined. The removal of the derricks in the Long Beach area will eliminate the hazard from high winds, furnish a greater safety element for the planes taking off and landing on the adjacent field, and aid greatly in fire-prevention problems.

The Rincon field will see 12 steel derricks and the ancient power plant removed from between the highway and the ocean along with their accompanying standard front ends. All pipe lines and accessory equipment will be rearranged so that motorists may get an unimpaired scenic view of the ocean at this point. The tank farms, oil sumps, and other facilities will be cleaned up and the entire property eventually landscaped.

Their voluntary decision to make this move is expected to encourage other petroleum corporations to do likewise and blot out many of the unsightly developments that dot the southern California landscape.

Natural-Gasoline Prices Up ¼ Cent

NATURAL gasoline prices last week finally responded to the rising demand for gasoline itself and climbed to ¼-cent higher levels in the Mid-Continent area.

It was the first change in natural gasoline quotations since late February when the price steadied after a series of declines in the late winter months. New quotations for 26-70 grade were 3 cents in Oklahoma, 2½ cents in North Texas, and 2⅞ in North Louisiana.

The improved position of natural gasoline was attributed primarily to the active gasoline market which the lighter product follows. Refiners are taking more natural gasoline for blending as gasoline is leaving storage for the consumer trade. Also contributing to the firmer position of natural gasoline is a heavy export and jobber demand.

No significant changes were noted during the week in the price of gasoline itself in the Mid-Continent area, although the market continued active with buying by major companies. Tank-car price of regular ranged upward from 5¼ cents. A strong farm demand was reported giving strength to the market in the middle and lower-octane grades. Gasoline prices were at ceiling or near-ceiling on the Gulf Coast.

In the New York area, gasoline prices were virtually back at ceiling following the action of Socony-Vacuum Oil Co., Inc., in advancing its prices in many parts of the area.

Residual held attention of many marketers during the week. An exceedingly heavy demand was intensified as consumers sought to replace coal with oil. Refiners were selling at ceiling which in the Group 3 area is $1.18. One large eastern power company was reported to have entered the residual market in Illinois, Oklahoma, and Ohio and bought some 100,000 bbl.

In New York, it was reported stocks of No. 2 oil are increasing slightly. Apparently anticipating an increase in price or removal of ceilings, jobbers were said to be filling storage. The situation in kerosene was described as similar to that in the lighter fuel oils. While the products are plentiful, they are not in as great a supply as usual at this time of the year.

California oil stocks have dropped to their lowest point in years. Production has lagged behind consumption in recent months, and supplies above ground have continued to dwindle.

In the national picture, gasoline stocks again dropped more than 1,000,000 bbl. during the week ending May 4. Gasoline demand was reported off 94,000 bbl. from the preceding week's high of 2,233,000 bbl. daily. Gasoline stocks, however, fell 1,083,000 bbl. to a total of 98,548,000 bbl.

Replies Held Insufficient In Survey on Oil Storage

OKLAHOMA CITY.—Oklahoma Corporation Commission officials say data obtained thus far in their survey of the oil storage situation has been of little value because of failure of all oil companies to cooperate.

More than 2 months ago the commission sent out special forms on which the companies were asked to report storage and other information. The action was taken after attacks on the commission's method of basing state allowables on figures from the United States Bureau of Mines.

Walker T. Pound, state conservation officer, said that the survey is considered unusable unless the forms are answered 100 per cent and that the commission is attempting for the third month to get sufficient response. The forms were revised last month after several companies complained they were ambiguous. Such a survey is not authorized by law, but the commission has requested it along with monthly purchase nominations.

Export Restrictions Lifted

WASHINGTON.—Petroleum jelly, mineral oil, and petrolatum last week were removed from the list of commodities requiring special licenses for export because of their short supply. The action was taken by the Office of International Trade of the Department of Commerce.

DEATHS

William Ihrig, 73, died May 9 at Oil City, Pa. Ihrig was a pioneer oil producer of Sugarcreek Township. He had extensive oil holdings in West Virginia, Ohio, and Oklahoma, in addition to those in Venango County.

A. J. Grace, 42, died May 9 in Grand Prairie, Tex., as a result of an automobile accident. Grace was an oil operator at Dallas.

John P. Cook, 71, died May 9 at Miami, Fla. Cook was a retired Texas oil operator.

Harvey O. Deardorff, 67, died May 7 at Elizabeth, N. H. Deardorff was formerly chief engineer for Tuscarrora Oil Co. in Linden, N. J., having been with the company from 1904 until he retired 2 years ago.

George Calvert, 67, died May 9 at Fayetteville, N. C. As an independent oil operator of Fort Worth Calvert aided in the development of many important Texas fields. In partnership with the late A. J. Broderick, also of Fort Worth, he drilled discovery wells for Harper and Ector pools of Ector County, and was also at Smackover and in the Permian Basin.

Robert H. Bartlett, 65, died May 11 at his home in Tulsa. Chairman of the board of Union Wire Rope Co., treasurer of Oklahoma Natural Gas Co., and a director of the Fourth National Bank of Tulsa, Bartlett was a pioneer in the oil and gas business, having started his career in 1896 at Bradford, Pa.

James E. Johnson, 76, associated with United Gas Corp. for 17 years, died recently at Austin, Tex.

Leslie Olson, head of the engineering, production, and sales of propane and butane tanks for Black, Sivalls & Bryson, Inc., died May 6 at his home in Oklahoma City.

Robert M. Patty, 37, who returned to Stanolind Oil & Gas Co. following his discharge from the Navy last December, died May 7 in Tulsa.

William A. Wise, 71, died at his home in Tyler, Tex., May 10. Wise was a pioneer oil man and driller in the fields of Pennsylvania, Ohio and Kentucky.

Frank H. Hollow, 44, died May 10 in Wichita, Kans. Hollow was president of Bridgeport Oil Co., Inc., and Western Lithograph Co.

A. D. Riley, 48, superintendent, East Texas-Louisiana division, The Texas Pipe Line Co., died at Lafayette, La., May 2. He entered the employ of the company in 1920, at Weatherford, Tex. After service in Mexia area, he was transferred to East Texas division and rose to be assistant superintendent in 1934 and superintendent in 1940.

W. P. Billingsley, 73, an industrial service engineer for Gulf Oil Corp., died May 3 in Dallas.

John N. Demorest, 63, independent operator, died at his home in Tulsa May 7. Demorest came to Tulsa in 1918 from Erie, Pa., where he had been a gas and gasoline consultant.

E. Leachman, 74, who retired in 1933 as assistant to the treasurer of Carter Oil Co., in Tulsa, died May 11 at his home in Los Angeles.

by Neil Williams

ESSO 1 STATE—

Most Easterly Test

Modern Exploratory

Esso 1 State, located in the shadow of historic Cape Hatteras lighthouse, overlooking the Atlantic Ocean

PROCEDURE followed by Standard Oil Co. of Delaware (New Jersey) in drilling its 1 State (Hatteras Light) at Cape Hatteras on the Atlantic Coast of North Carolina is indicative of the thoroughness with which modern exploratory operations in virgin territory are conducted. It involved not only the use of every scientific means at the operator's disposal to obtain the maximum amount of information concerning the geologic section and sedimentary conditions of the region, of which heretofore little has been known, but also the adoption of all precautionary measures and provision of adequate facilities to expedite consummation of the objectives with a minimum of trouble and delay.

The thoroughness of the undertaking was reflected in the elaborate preparations made for drilling the test. Remoteness of the location from oil centers and consequent inability to obtain supplies and servicing on short notice when needed made it necessary to have on hand everything so far as possible that might be needed during the drilling if long shutdowns waiting for rig servicing, repair or replacement equipment, or other materials were to be avoided. This called for careful planning to anticipate these needs and arrange for the necessary materials and supplies.

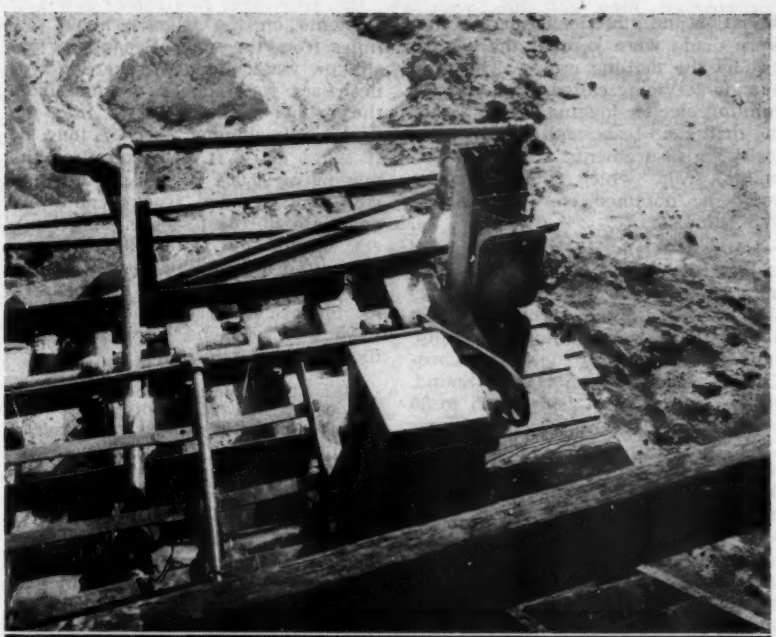
Among the wide assortment of supplies provided in advance were a large stock of cement, mud materials and chemicals; extra rig-repair and replacement parts for most any contingency, including auxiliary and standby units in some cases; bits of various sizes and types that might be used on the entire job, and a complete line of tools and small shop facilities for making most any repair or replacement that might arise. Mud materials and chemicals included

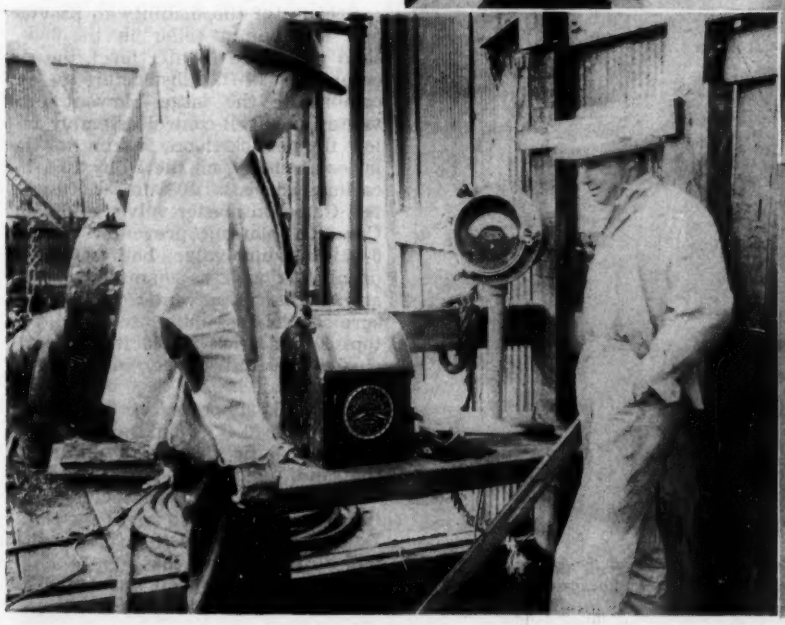
Nation's Exemplifies Operations

2,500 sacks of Aquagel, 1,000 sacks of Baroid, 5,000 lb. each of quebracho and caustic, and substantial quantities of Fibretex and Jell Flake for anticipated lost circulation. It so happened that very little Baroid or lost-circulation materials had to be used. Other mud materials had to be augmented only once during the entire job. A 50 by 80-ft. warehouse was built at the location to store these materials. As a result of these preparations there was no lost time because of waiting for supplies.

Service Facilities

In addition, facilities were provided and pumps were hooked up so that all cementing operations could be performed with the regular rig equipment and by drilling crews, thus avoiding the long trips and time that would be involved for regular cementing services to be brought to the well. Also a complete laboratory was set up so that all core analyses and other exploratory interpretations could be made at the well. Tools and instruments for the frequent hole-





Top—Automatic mud-weighing and recording apparatus provided on Hatteras wildcat

Above—Walter Spangler, resident geologist, examining mud sample under fluoroscope in rig laboratory. Complete cores are kept in boxes on shelves at rear

Left—Ed Leroux, Carter Oil Co., petroleum engineer, and "Spike" Miller, toolpusher, Noble Drilling Co., watch drilling-time record being made by Geolograph. Indicating gage is for gas detector, located on mud-return line below derrick floor

deviation and directional surveys that were made were kept at the rig for use by the drilling crews. The only outside servicing called upon was for running electric-logging surveys, taking drill-stem tests, and obtaining velocity measurements. The closest points from which these services could be obtained were Mississippi and Illinois.

Hatteras Island, on which the well is located, is one of a string of long, narrow, flat and barren sand banks that stretch out along the east coast a distance of several hundred miles. It is separated from the North Carolina mainland by Pamlico Sound, which at that point is from 25 to 30 miles wide. The well location, near Cape Hatteras at the southeasternmost tip of the island, is about 110 miles south of Elizabeth City, the nearest rail point, in the extreme northeast corner of the state. A paved highway extends down the string of islands a distance of about 50 miles from that city, serving resort hotels and summer homes that line the beach, but beyond that there is no maintained road and because of the deep, loose, and shifting sand, the location is inaccessible by land except for light traffic and often only by four-wheel-drive vehicles with partially deflated tires.

For this reason, it was necessary to transport all equipment and supplies for the well by water route. Barges for this purpose were loaded at Elizabeth City and towed down the sound behind the island string to an unloading dock which was built at Buxton, one of the few small settlements on the islands, about 2½ miles from the well. Because of the shallow water along the shore, it was necessary to dredge a channel from the deeper offshore water into the dock. This channel, 4,500 ft. long, 90 ft. wide, and 6 ft. deep, required the moving of 90,000 cu. yd. of sand and silt. Since loaded trucks could not negotiate the deep, loose sand, trailers drawn by Caterpillar tractors were used for hauling equipment and supplies from the dock to the well location. Seven barge loads, totaling 1,100 to 1,200 tons, were moved to the well in this fashion.

Operating Personnel

Drilling of the well was contracted to Noble Drilling Co. of Tulsa. Since Standard Oil Co. of Delaware, a marketing subsidiary of New Jersey Standard, did not have a drilling or production organization of its own, technical and operating supervision was borrowed from Carter Oil Co., with Ed Leroux, assistant superintendent of the latter company's Oklahoma-Kansas district, being placed directly in charge as petroleum engineer, working with "Spike" Miller, toolpusher and engineer for the drilling company. Walter Spangler, geologist in the New York office of the New Jersey company, was made resident geologist on the job. Working with him and performing other supervisory and liaison duties was Kenneth A. Ackley, geologist for Carter.

Near the historic Cape Hatteras lighthouse, the well location is within 300 yd. of the Atlantic ocean shoreline, with Pamlico Sound less than a mile away on the inland side. Despite the proximity to salt water, fresh water for all drilling purposes is obtained at a depth of 2 ft. To supply this water a pit 30 ft. long, 8 ft. wide, and 4 ft. deep was excavated in the sand with a bullldozer, and walled with timbers. Natural flow keeps this full, and the water is pumped directly to the rig water system.

The rig is a special assembly, adapted to the particular requirements of this location, and is made up of units taken from several different rigs in both Oklahoma and Louisiana. It is powered by two 325-hp. diesel-fueled engines compounded to a direct drive to a main 7¼ by 18-in. mud pump, and to two 125-kw. generators supplying direct current to two electric motors which drive the draw works and to a third motor on the independent rotary drive. The secondary 6 by 12-in. mud pump, used for mixing mud, also for mixing cement when needed, and for general auxiliary and standby service, is independently powered with a 125-hp. diesel engine. All three engines can use either gas, butane, or diesel fuel, but are using diesel oil for fuel on this job. The draw works previously had been in service on a large steam rig. The two motors which replace the steam engine operate through a direct shaft connection, one on each side, to the main draw works drive.

Approximately 20,000 gal. of diesel-fuel storage was provided. This consists of an 8,000-gal. tank set up at the barge-unloading tanks, and about 12,000 gal. at the rig. To avoid having to haul the fuel over the sandy road, a 2-in. line was laid from the dock tank to the rig storage, to which the fuel is pumped.

Looking down the long mud-return ditch mounted along the top of the row of three steel mud pits (suction pit tank in rear with mud pumps at left). In background is corner of large mud house and store room

Well Control Hookup

Because of the inability to provide and maintain a cellar in the loose sand with a 2-ft. water level, the rig employs a 14-ft. substructure to accommodate the large blowout preventer and well-control assembly below the derrick floor. Making up the latter assembly, on the 16 by 10¾-in. casinghead, is a 10¾-in., 6,000-psi.-test Cameron master valve, a 10¾-in. Cameron blowout preventer with a 6-in. flow-line valve, both with hydraulic as well as manual controls, and a Hydril preventer, with pressure-control assembly removed, on top. The derrick is 136 ft. high, exclusive of substructure, with a 30-ft. base.

The rig is supported on a mat constructed of 40-ft. lengths of 3 by 12-in. Douglas-fir timbers laid flat on the sand, which first was leveled off with a bulldozer. Base members of the substructure rest on 12 by 12-in. Douglas-fir timbers (40-ft. lengths) laid directly on the mat.

Location for the well was made October 2, 1945. Tools were shipped

from Louisiana and Oklahoma October 24, rigging up was started November 24, and the hole spudded December 1. The well was undertaken as a test of the entire sedimentary section to the granite, which, according to geologic studies and geophysical profiles, had been expected at a depth of from 7,500 to 8,000 ft. As this is written, total depth is 8,517 ft. without reaching the granite. At this time, drilling has been interrupted by a fishing job to recover drill pipe stuck 40 ft. off bottom. Velocity measurements made when the hole was at a depth of 7,832 ft. indicated that granite might be expected within a few hundred feet below the present depth.

Casing so far run consists of 36 ft. of 25-in. conductor in 28-in. hole; 116 ft. of 20-in. pipe in 24-in. hole; 510 ft. of 16-in. pipe in 19-in. hole, and 4,007 ft. of 10¾-in. pipe in 15-in. hole. Below latter string, 9⅞-in hole has been drilled. Although this number of strings was considered justifiable as a safety precaution in view of the uncertainties existing in an initial test, operators are of the opinion that the formational conditions found will permit the drilling of subsequent tests with only a conductor string and about 1,000 ft. of 16-in. surface pipe.

Drilling Program

Conductor hole was drilled with a fishtail bit. In view of the loose sand, operators had figured on having to drive this pipe but the hole was made without trouble and the pipe followed down. In cementing this pipe, to avoid the danger of washing out the sand under the derrick with pump pressure, the cement (25 sacks) was dumped into the pipe. Water then was poured in and the cement mixed by rotating the kelly. With a wooden plug dropped on top, the slurry was pushed out the bottom and up behind the pipe with the weight of the kelly. The operation was repeated to get the cement to the top.

The 24-in. hole below the conductor also was drilled with a fishtail bit, and although the section drilled consisted of very loose sand and gravel no trouble was experienced in running the 20-in. pipe, which was cemented in conventional manner. Hole for the next string was drilled with 9⅞-in. wire-line core-drilling bits, and then reamed with a 19-in. three-way drag bit. It was carried to 1,000 ft. where the 16-in. string was to have been set. This string, however, stuck at 510 ft. and was left at that depth because of the danger of caving the hole by attempting to free the pipe and rerunning.

Hole for the 10¾-in. casing was drilled with 9⅞-in. wire-line core-drilling bits, and then reamed with a 13¾-in. rock bit. In attempting to run the string it was impossible to get the pipe below 1,800 ft., so the string was pulled and rereaming the hole, using a 15-in. pilot bit with 15-in. reamer blades, was undertaken.

While reaming at 2,354 ft., a double twistoff occurred, the 4½-in. drill pipe parting in two places about 18 ft. apart just above the drill-collar sub. The fish, except for the 18-ft. section of 4½-in. pipe which evidently had dropped down between the reamer blades and become lodged in the wall of the hole, was recovered after 8 days with an overshot and a set of rotary jars flown in from Houston. Reaming was continued to bottom with the 18-ft. section of pipe still in the hole but it gave no trouble and the 10¾-in. pipe was run and cemented without further incident. Although the lost section was regarded as a constant threat of trouble during later drilling, an electric-logging survey run with the hole at 7,832 ft. gave no indication of the presence of the section and it is now presumed that the section is behind the 10¾-in. casing and safely out of the way.

Contributing to the complete information on the well have been not only the close check and study of cutting samples taken from the mud returns but also a rather extensive core record, augmented by sidewall core samples, electric logs, drill-stem tests of questionable sands, and a continuous drilling-time record kept by a Geolograph. In addition, rig facilities included a gas detector, mounted on the mud-return stream and having a dial gage on the derrick floor to indicate the presence of any gas in sands drilled. Although no gas was indicated at any time, the detector served as a means not only of logging gas sands that might otherwise have been passed up unwittingly but also to warn of any increasing gas infiltration into the mud returns in time to take the necessary measures to prevent a possible blowout. As a further exploratory aid, frequent mud samples from the returns were analyzed under a fluoroscope in the laboratory for possible oil traces.

In the laboratory, in addition to other analytical and interpretative determinations, specific gravity of every core sample was checked and recorded, and a pentane ether cut test made of every sand drilled. All cores were carefully classified and placed in protective cases in systematic order.

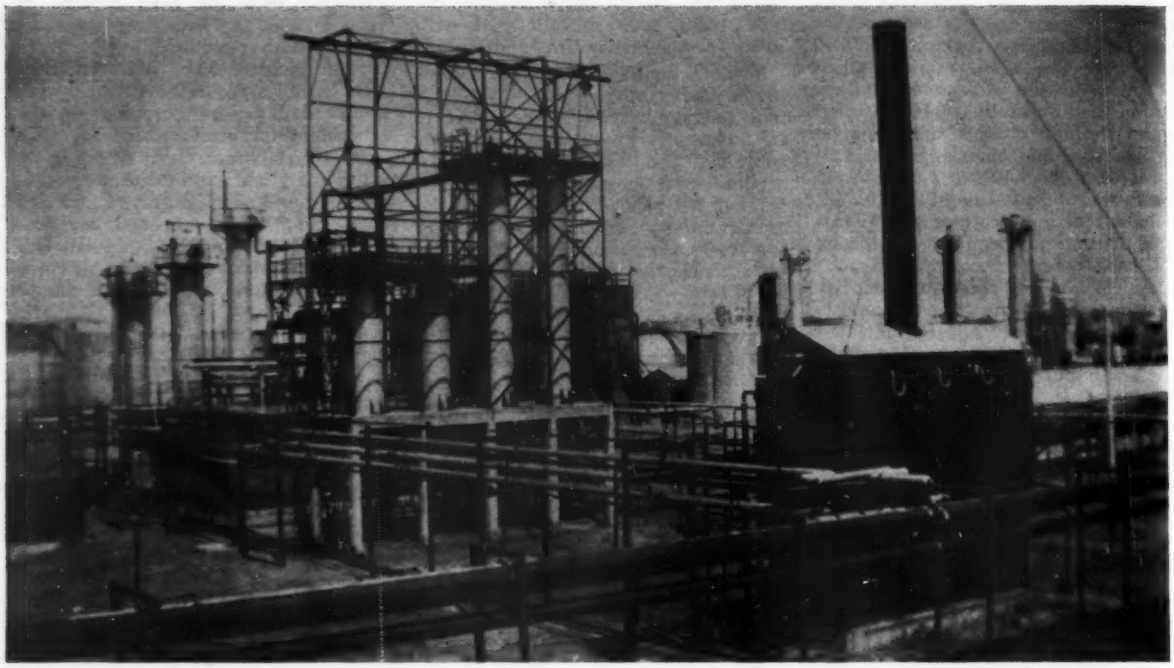
Exploratory Methods

Down to 8,000 ft., more than 120 cores were taken with nearly 1,200 ft. of hole being cored. All were taken with wire-line core barrel in the 9⅞-in. coring-drilling bits used for making all new hole below the 20-in. casing at 116 ft. More than 50 per cent recovery was obtained. First core was at 346-56 ft. and was followed with a core every 50 ft. to 3,060 ft. and every 100 ft. from that depth to 4,600 ft. Below this depth the practice of taking cores at regular intervals was dropped in favor of coring only breaks. All sand bodies have been cored continuously. Eighteen sidewall core samples were obtained at various levels.

Two electric log surveys have been made, the first from a depth of 4,604 ft. and the second at 7,832 ft. Drill-stem tests were taken in two sands, one at 6,483-6,512 ft. in the top of the Tuscaloosa, and the other at 7,028-81 ft., in the same formation. Both showed salt water but were taken as an extra precaution against the chance of passing up something al-

(Continued on page 156)

George Kimnitz, vice president and general superintendent, Noble Drilling Co., Tulsa, donned his work clothes to check personally the mud condition in the suction pit



View of Skelly polymerization unit. The gas-oil accumulator and charge-stock accumulator are shown at left; the four reactors are shown in the center while the gas-oil heater appears in the right foreground

Poly Plant Converts to Peace

by Harry E. Chambers and W. L. Pursell

THE polymerization unit of Skelly Oil Co. at its refinery at El Dorado, Kans., was put into operation in the spring of 1940. It is a Kellogg chamber-type plant using Kellogg copper pyrophosphate catalyst with four reactors. Two of these reactors were purchased new and the other two were converted from old Cross cracking-unit reaction chambers.

In 1942, two reactors were changed over to the manufacture of cumene which is an alkylation product of benzene and propylene. The other two reactors were converted to the manufacture of codimer or polymerization of butylenes. These two materials were used as blending agents in the manufacture of aviation gasoline. Total production of these two products during the war period was responsible for the satisfactory blending of several million barrels of aviation gasoline.

With the end of the war these units were immediately reconverted to the manufacture of polymer blending stocks for motor gasolines.

In the preparation of the feed stocks for the catalytic polymerization unit, the charge to the debutanizer tower at the vapor-recovery unit is caustic scrubbed and water washed so that the overhead from this debutanizer is satisfactory for charging to the polymerization unit without additional treatment. This feed stock is pumped from the charge accumulator through an exchanger where it exchanges heat with the reactor effluent, and then through a gas-fired charge preheater into the first reactor on the line. The reactors are operated in series flow. Recycle of the tail gases is accomplished by pumping these tail gases into the charge just before the charge enters the preheater.

The temperature of the charge out of the preheater is maintained at not over 400° F. There is enough heating surface in the preheater furnace so that the heat transfer is only 9,000 B.t.u. per hour per square foot and the charge flow rate is 3.5 to 4 ft. per second. This gives a very low, if any, amount of thermal polymerization. Thus there is also a minimum of gumming on the top catalyst bed. As the first beds become spent their temperatures drop to about 395° F. The first active bed is allowed to pick up the temperature 10° to 20° and the following beds can pick up the temperature to 435° F. which is operating temperature to get 85 per cent conversion. When all the beds are spent in the first reactor it is taken off the line and the catalyst is changed.

The effluent from the reactors first goes to the heat exchanger where it exchanges heat with the charge stock and then goes through the back pressure regulator, through a cooler, and into the polymer debutanizer tower. The cooler has a bypass around it so that the temperature of the charge to the debutanizer can be controlled. The heat exchange of the effluent ahead of the back pressure valve serves a dual purpose of conserving heat and reducing erosion in the line between the back pressure valve and the cooler by reducing the velocity due to vaporization at the back pressure valve.

The polymer is debutanized to 10-lb. R.v.p. and shows a trace of sourness to doctor test. It is treated with the other gasoline to remove a slight odor and to make it doctor sweet.

As has been stated, the charge preheater is gas fired. There is also gas-oil circulation system to heat the de-

butanizer reboiler and to heat the tail gases for dehydrating and bringing freshly charged reactors on the line.

Two of the reactors have five catalyst beds and the other two have only four. All catalyst beds are about 5 ft. high. A catalyst-charcoal mix of 2 to 1 by volume is used though there is no reason to believe that some other mix would not be satisfactory. A 1-ft. bed of charcoal is used between the bottom tray and bed in each reactor and a 3-in. bed of charcoal under each of the other beds. This proved to give the best protection against catalyst carryover in cumene manufacture where the carryover problem was the worst.

Both gate valves and plug valves are provided on main flow lines of the reactors. For the plug valves in this 430° F. service it is hoped the new silicone lubricants will prove worth while.

Reactor temperatures are taken by thermocouples located 2 in. under the tray of each bed. The quench pipes to the next bed are located below this thermocouple. The reactor temperatures are controlled by quenching each bed with the debutanizer overhead, or tail gases.

For dehydrating and putting new catalyst beds into service the standby reflux pump for the polymer debutanizer is used to pump the effluent C_4's and lighter, or debutanizer overhead, through a heater that is heated by the circulating gas oil, into the freshly charged reactor. The heater outlet temperature is progressively raised by hand control to 240° F. in a period of 4 hours. The temperature is then raised 10° each hour up to 390° F. The bed temperature lags somewhat behind this heater-outlet temperature especially if there is much dehydration. Water is then drained from the bottom of the reactor. This is believed to be important because deep corrosion has been experienced at times in this bottom neck of the reactor. It is felt that recent developments in catalyst preparation will make this dehydration procedure unnecessary.

H. E. CHAMBERS

W. L. PURSELL

Harry E. Chambers attended Utah Westminister College and was graduated from Ohio State University with a B.S. in chemical engineering. He worked 1 year as technologist with Harding Glass Co., Fort Smith, before joining Skelly Oil Co. in 1929. He served in a supervisory capacity at Skelly's natural-gasoline plants at Skellytown and Stinnett, Tex., and at Seminole, Slick, and Lyman, Okla. He was transferred to the research department at Pawhuska, Okla., in 1942 and about a year later was put in his present position as process engineer at the company's refinery at El Dorado, Kans.

W. L. Pursell attended Tulsa University and was graduated from Oklahoma A. & M. with a B.S. in electrical engineering. He took graduate work and received an M.S. degree in chemistry and mechanical engineering from A. & M. in 1937. He joined Skelly as a research engineer immediately after leaving school and was located at the company's refinery at El Dorado. He later served as operating supervisor over various refinery units and was placed in charge of the refinery process engineering department in 1945.

Small Line Used

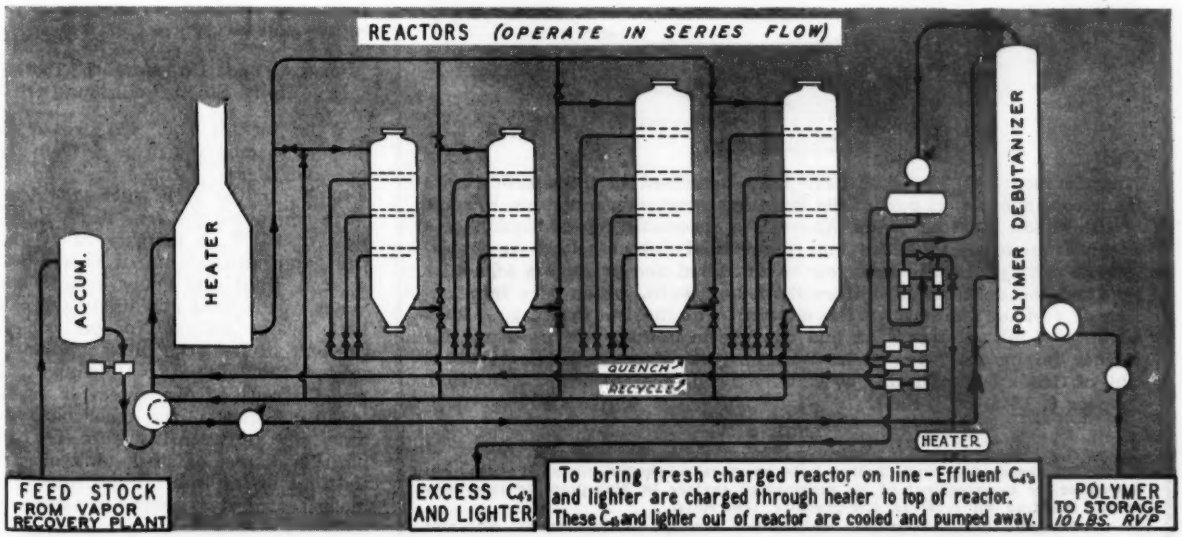
A ¾-in. line connects from the outlet of the nearest operating reactor to the inlet of the new reactor. By using this small line to bring the pressure up on this new reactor it has been possible better to hold this pressure rise to a small rate of not over 150 psig. per hour. When the pressure is up to operating pressure of 900 psig. the new reactor is put on the tail end of the line. The oldest reactor on the front end of the line apparently filters out any slight amounts of ammonia that may be in the charge and thus saves the following live reactors.

When the plant was first put into operation there often was difficulty in removing spent catalyst from the reactors as it had become disintegrated and packed hard and air-driven tools were necessary to loosen it. Proper handling of the catalyst has overcome this difficulty so that now the catalyst remains in pellet form until spent and is easily removed.

The fire hazard involved will increase in case the catalyst is removed from a reactor that still shows signs of activity.

Care is taken whenever possible to lower the reactor temperature slowly before shutting the unit down and to avoid any sudden pressure changes on the catalyst. These precautions aid

(Continued on page 138)

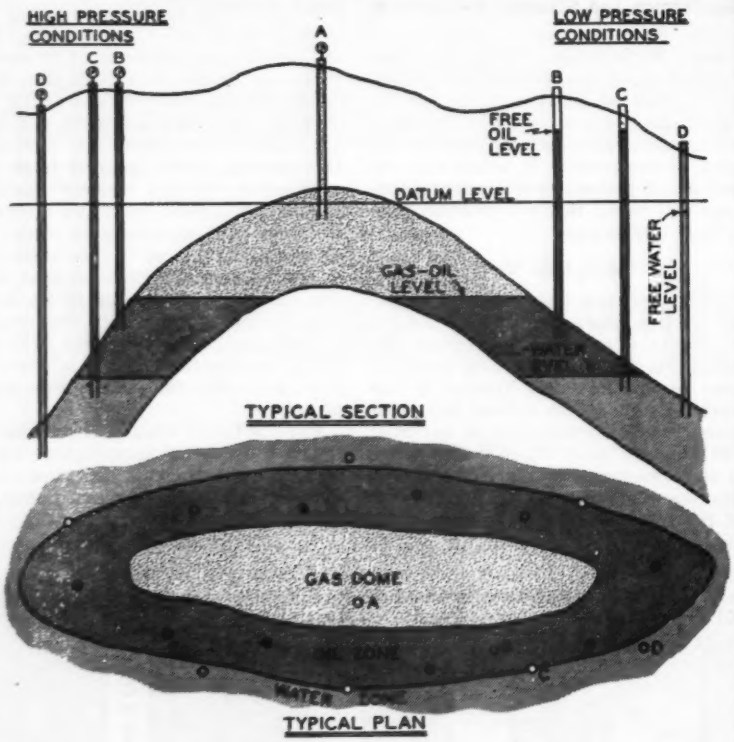

REACTORS (OPERATE IN SERIES FLOW)
ACCUM.
HEATER
QUENCH
RECYCLE
POLYMER DEBUTANIZER
HEATER
FEED STOCK FROM VAPOR RECOVERY PLANT
EXCESS C_4's AND LIGHTER
To bring fresh charged reactor on line - Effluent C_4's and lighter are charged through heater to top of reactor. These C_4's and lighter out of reactor are cooled and pumped away.
POLYMER TO STORAGE 10 LBS. RVP

Flow chart of operation of polymerization unit at refinery of Skelly Oil Co., El Dorado, Kans. In bringing a freshly charged reactor on stream, a butanes-and-lighter stream is pumped through the heater and to the top of the fresh reactor; exiting from the bottom of this reactor the stream is pumped away while the reactor has been brought to temperature and is switched on stream in series with other reactors

Well Interference and Reservoir Drainage

by Kenneth B. Barnes

This article concludes a four-part discussion of well-interference studies. Previous articles have appeared in issues of April 13 and 20, and May 4



"Interference tests" such as have been described in these articles are made continuously, as part of the long-time producing programs, in some of the Middle East oil fields. Above is a schematic representation of a South Iranian oil structure and the special "observation" or "interference test" wells. The reservoir is controlled and producing schedules set from the data obtained from these key wells, which give information at various locations on the expansion of the free gas cap, rate of advance of oil-water contact, and changes in bottom-hole pressure [for further details, see "Five Fields With 51 Wells Produce Total of 365,000 Bbl. of Crude Daily (Iran)," by C. O. Willson, The Oil and Gas Journal, October 6, 1945, pp. 74-80].

LEGEND

A. Gas observation well; pressure measured by dead-weight gage.

B. Oil observation well; bottom-hole pressure originally taken by gage, but thereafter by measurement of (1) pressure at surface in high-pressure reservoirs or (2) the free oil level in low-pressure reservoirs.

C. Oil-water level observation well drilled through oil into water; oil-water level is obtained by "pickup" from a float run on a measuring line.

D. Edge-water observation well drilled into edge water; bottom-hole pressure originally taken by gage, but thereafter by measurement of (1) pressure at surface in high-pressure reservoirs or (2) the free-water level in low-pressure reservoirs.

PREVIOUSLY established pressures are altered when fluid flow occurs within a productive area. This simple natural law is the basis of well-interference tests. A well is produced. If the pressure drops in adjacent wells, it is proof that there is continuous permeability and formational interconnection between the wells. More important, though, is the corollary that the pressure declines or interference data so established are prima facie evidence that oil present in the formation is flowing from the location of the one well to the other well. When flow occurs, drainage occurs. Such tests thus can help prove or disprove whether drainage of the particular area can be accomplished —and by what wells and over what distances.

The well-interference tests hereinafter presented, together with examples of reservoir drainage, show that fluid flow between wells and drainage of large areas by relatively few wells have taken place in specific fields. In some of the illustrations given, the data prove that continuous permeability and formation interconnection exists for distances of 1, 2, 3, and even more miles. On the other hand, simply because these things have been found in certain pools of course is not evidence that faults, impermeable barriers, and formational discontinuities do not exist in some other pools between comparatively short distances. For this very reason, interference tests are helpful tools to use in studying spacing and drainage problems. In these problems, if interference data show fluid flow to be possible over a certain distance, then it would seem that reasons for advocating well spacings on lesser footages should be based on considerations other than those of fluid-flow relationships in the physical sense—and vice versa.

Reverse Type Interference Test—Holly Ridge, Louisiana

Wells in this pool are drilled on 40-acre spacing and produce from the massive Basal Tuscaloosa sand at 8,400 ft. In the area where the tests were conducted the sand has a thickness of 25 ft., a porosity of 20 per cent, and permeability of 35 md. The sand is tight and shaly around the edges of the field and likely there is little water influx. No gas cap is present, in fact, the oil is undersaturated, the bubble point being 3,551 psi. Viscosity of the reservoir crude is 0.9 centipoises, and reservoir volume at saturation pressure is 1.54 bbl. per barrel of stock-tank oil. At the time of the interference tests, the measured pressures were in excess of 3,670 psi., which means that the reservoir fluid at the time of the test was in a gas-free state.

The interference test was made by shutting in for 30 hours the eight

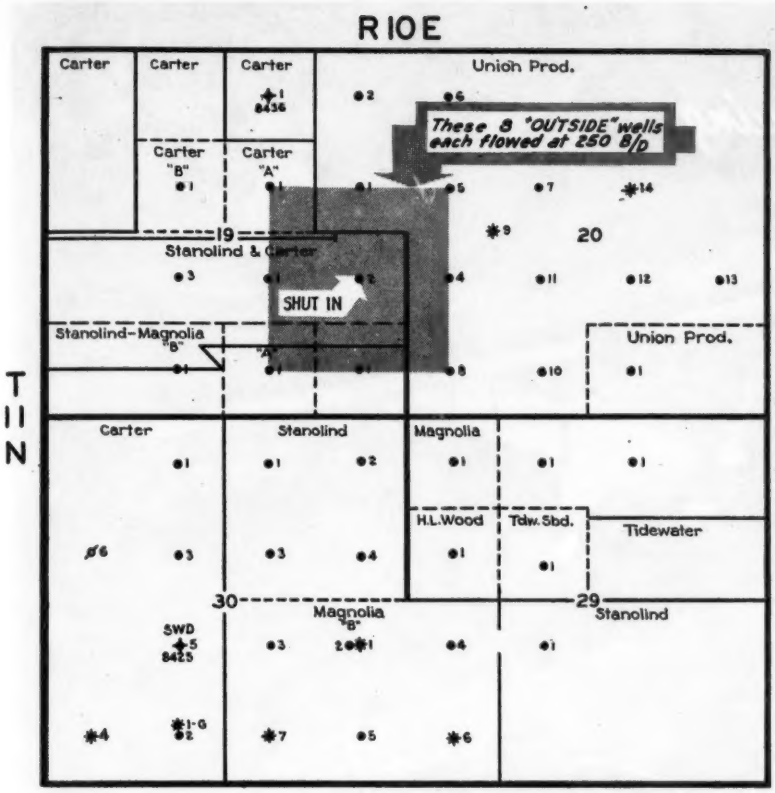
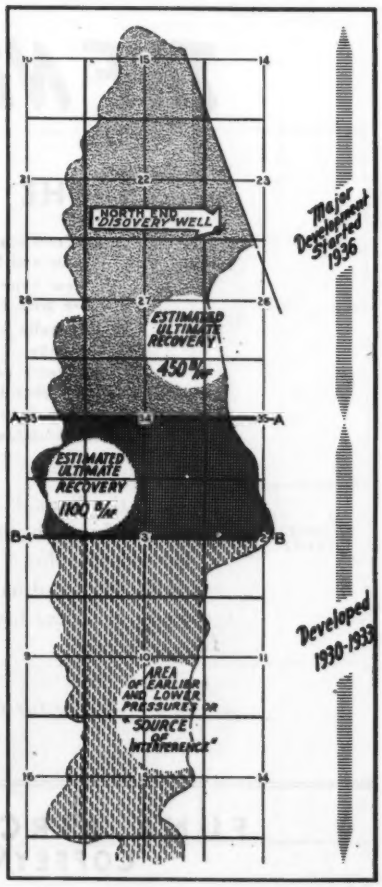


Fig. 1—(Left) Holly Ridge pool, Louisiana. Reverse-type interference test in a "tight" formation (35 millidarcys). Pressure decline was 30 psi. at central well after 69 hours of production by offsets. Spacing: One well to 40 acres. Bottom-hole pressure: 3,700 psi.

Fig. 2—(Below) Oklahoma City Wilcox pool. This illustrates "intra-reservoir interference" and long distance-large quantity movement of oil. Due to earlier development to the south and consequent lower reservoir pressures there, an estimated 60 million barrels of oil migrated from the area north of A-A. The calculation indicates this is being recovered in the sector A-A to B-B



wells forming the square in Fig 1. During this time the bottom-hole pressure in the center well increased to 3,700 psi. The eight outside wells were then produced at the rate of 250 bbl. per well per day. Interference caused by this production upon the closed-in pressure of the one well was reflected by a 10-psi. pressure drop after 20 hours and a 30-psi. decline after 69 hours production by the offset wells. Calculations indicated that if the test had been continued for 30 days, the pressure in the shut-in well would drop 356 psi., and for a 3-month period producing interval the drop would be 609 psi.

A striking example of the flow of oil over long distances and an idea of the drainage which can occur is represented in the three interconnecting areas of the Burbank field. The large North Burbank area, in western Osage County, Oklahoma, which covers 20,000 productive acres, was developed principally in 1921 - 1924. Most of the productive limits soon became well defined. Initial bottom-hole pressure area has been estimated to be approximately 1,300 psi.

As sometimes happens in Pennsylvanian age deposits in the Mid-Continent, an adjacent productive area later was found. This was the long, narrow "Stanley Stringer" strip, approximately ½ mile wide and 7 miles long. The Stanley Stringer was drilled in 1926.

Wildcat drilling a few miles south of the Stanley Stringer brought about the discovery of the South Burbank pool, with development in 1934-1936. Bottom-hole pressure gages were in use during development of the South Burbank area, and the original bottom-hole pressure has been placed at 1,125 psi.

All three of the Burbank producing areas are at the same depth, and careful geological studies, together with those of the repressuring performance of the wells (all three pools later were gas repressured) have proved that the three areas are connected and intercommunicating. The connection between North Burbank and the Stringer is minor, but that between Stringer and South Burbank is of major order. Thus, the two northern areas, and particularly the Stringer, can be said to have "interfered" with South Burbank in that the several years of production from the former was responsible for the diminishment of some 175 psi. of the bottom-hole pressure at South Burbank. As a matter of fact, shortly after South Burbank was drilled it was found that a pressure gradient of 1,000 psi. existed between South Burbank and the Stringer. Thus the fluid flow and drainage here were over a minimum distance of 7 miles —with the "pipe line" or permeable connection being the narrow Stanley Stripper part of the reservoir.

Drainage of North Extension by Main Oklahoma City Pool

The Oklahoma City Wilcox sand pool during the years 1930 and 1933 was drilled and produced solely in the area south of the line A-A of Fig. 2. Drilling in the area to the north of A-A started late in 1935 with the majority of the development being done in 1936. Prior production in the area south of A-A resulted in lower pressures in that sector. Analysis of the production and reservoir data have indicated that the resultant pressure gradient was responsible for movement of large quantities of oil southward, and that the area between A-A and line B-B received substantially all the drainage from the north. There is no detectable areal gradation in sand quality to the north of B-B.

The ultimate drainage from north of A-A has been calculated to amount

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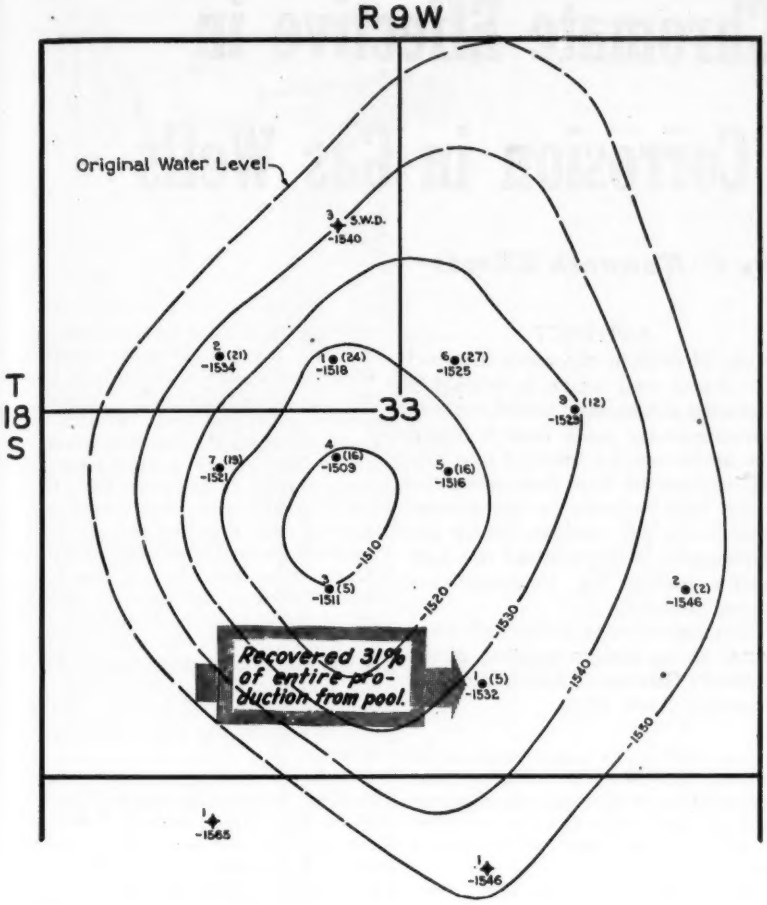


psi. in the south-end discovery well. Also, the well had an initial gas-oil ration of but 550 cu. ft. per barrel. in comparison with the average of 1,000 in the first completions in the southern and older part of the pool.

Ploog Pool, Rice County, Kansas

A concrete example of the ability of a single well to drain a considerable part of a pool is found at Ploog, an Arbuckle (depth 3,200 ft.) lime field in central Kansas. One well recovered 450,000 bbl., or 31 per cent of the ultimate production of a 10-well field. This well, 1 Ploog, produced alone for the first 30 months of its life, and accordingly had access to a large area before the other wells were drilled. Average ultimate recovery of the other wells is only 111,000 bbl., with the maximum being 235,000 bbl. Since the field is 97.6 per cent depleted, the recoveries in this example are rather conclusively established.

Regionally, the pool is located on the eastern flank of the Central Kansas Uplift. The structure (see Fig. 3) contains 454 acres above the original water level of —1,550 ft., with closure of 41 ft. on the productive formation. Oil occurred in porous zones near the top of the lime. While core data are incomplete, analyses show porosity up to 27.5 per cent in the pay zones. Continuity of the permeable zones is established by a regular and continuous progress of the advancing water front as it moved up the structure.

(Continued on page 157)

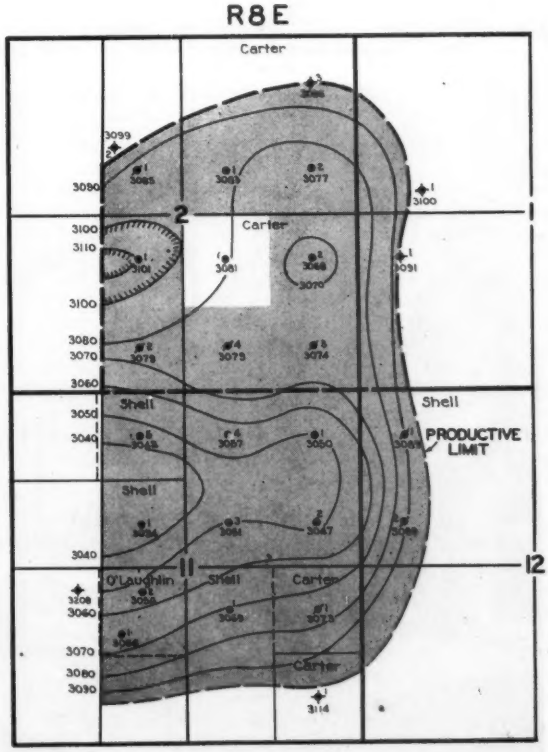
to approximately 60 million barrels of oil, part occurring prior to drilling north of A-A, and part, after the northern area had been drilled, as the result of continuing pressure gradients across A-A to the south.

To place the status of the 60 million barrels of migrated oil in recovery units, it has been estimated that the area between A-A and B-B will have an ultimate recovery of 1,100 bbl. per acre foot, in contrast to an average of 450 bbl. in the area north of A-A. Further significance of the high recovery from A-A to B-B sector, as related to a large amount of migration, is the fact that 1,100 bbl. per acre foot is approximately 95 per cent of the stock-tank oil originally in place in the pool. This far exceeds the pool average recovery of 50 per cent of the stock-tank oil in place.

Completion data of one well in the area north of A-A also can be used to show the result of the "large quantity-long distance" flow and drainage of oil at Oklahoma City. The well north of A-A in Fig. 2 was one of the first north-end completions, being placed on production November 10, 1935. It had an initial bottom-hole pressure of only 575 psi. in comparison with the original pressure of 2,630

Fig. 3—(Above) Ploog pool, central Kansas. Example of widespread "interference" or drainage. The first well (indicated by arrow) and sole producer for 30 months, fairly low on structure, will recover 450,000 bbl. as against an average of only 111,000 bbl. each for the other wells

Fig. 4—(Right) Dill pool, east central Oklahoma. Example of drainage of 40-acre wells producing from a tight limestone formation (Hunton). All of the shaded area was developed in 1936. When the one remaining location (white square) was opened to the Hunton in 1941, it was found to be in a state of depletion equaling the offsets



Sodium Chromate Effective in Combating Corrosion in Gas Wells

by C. Kenneth Eilerts *

ABSTRACT

Sticks of sodium chromate dropped into a gas well which is subject to corrosion maintained inhibiting concentrations for more than 2 hours. The sticks can be injected into tubing against the fluid flow when the mean fluid velocity is not greater than 11 ft. per second. Many improvements in the method are necessary before the treatment becomes practical.

This article was presented as a paper at the Dallas meeting of the Natural Gasoline Association of America, April 18-19.

GAS-CONDENSATE wells in which the annular space between the tubing and casing is closed with a packer or a mud filling are difficult to treat with a corrosion inhibitor. It is not possible to inject an inhibitor or a solution of an inhibitor into the lower end of the tubing through the casinghead or annular space. If a gas or liquid is to be used it must be injected into the tubing through a "macaroni string"—a small tubing hung inside or outside of the standard tubing—and the small tubing should be of the length of the well tubing that is to be protected. On or about October 12, 1945, the writer conceived the idea of treating such wells by dropping into the tubing a treating agent in a solid form of such dimensions and specific gravity that it would fall into the tubing against the flow of the fluid. The solid would fall until it came to rest at the bottom of the tubing or on an obstruction in the tubing, and there, would be slowly dissolved in the liquid-water phase or other phases of the flowing fluid. The solution of the solid would spread over the steel surfaces to be protected as the flowing fluid moved toward the surface.

Preliminary investigations were made in the laboratory to devise an inhibitor in a solid form suitable for injection. Sodium chromate ($Na_2CrO_4 \cdot 4H_2O$) was mixed with various binding agents—principally forms of sodium silicate—and molded into sticks to obtain a solid that would be strong enough to permit shipping, dense enough to fall through a flowing fluid and with dissolving characteristics such that the rate at which the stick formed a solution with water could be controlled. It was found that a stick with desirable density and strength could be formed by casting molten sodium chromate. Castings of sodium silicate dried under different conditions of temperature provided a measure of control over the rate at which the stick dissolved in water.

With the assistance of N. Bryan Mullens, sodium chromate ($Na_2CrO_4 \cdot 4H_2O$) was dried, melted (1,458° F.) and poured into a mold to provide anhydrous sticks 1⅛-in. diameter by 8-in. length weighing approximately 0.6 lb. each. The sticks were fitted with

*U. S. Bureau of Mines.

Fig. 1—Preparations for filling the well-head magazine with sticks of inhibitor to be used in treating the fluid flowing through the tubing.
Fig. 2—The well-head magazine charged and under pressure, ready for dropping the sticks of inhibitor into the tubing

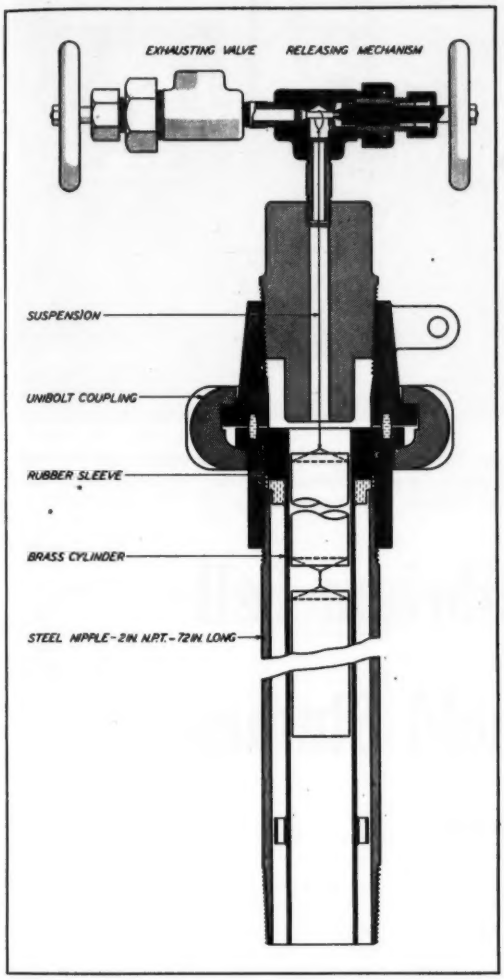


Fig. 3—This design provides a well-head magazine for injecting solid treating materials under pressure

nylon cord ties, heated to 140° F. and dipped into sodium silicate $Na_2O \cdot 3.22 SiO_2 \cdot XH_2O$) at the same temperature. By means of the ties the sticks were suspended from a horizontal bar to air dry the coating over night. The following day the dry sticks were packed in ground cork for transportation by automobile to Cotton Valley, La.

A magazine for holding the sticks under pressure prior to dropping them into the well tubing was constructed substantially as shown in Fig. 3. In use, steel nipple (7) with the lower half of Unibolt coupling (4) attached is screwed into a full-opening tubing-head valve so that it stands in a vertical position above the christmas tree and is concentric with the axis of the tubing. Brass cylinder (6) containing the sticks of inhibitor bound together with cord, is inserted into nipple (7) and when suspension (3) has been attached to releasing mechanism (2), coupling (4) is closed. After the tubing-head valve has been opened, the threaded stem in releasing mechanism (2) is screwed outward to disengage suspension (3) and permit the sticks to fall. It may be desirable to have the fall of sticks retarded until the lowest one has entered the tubing so that they will be less likely to catch on an obstruction in the christmas tree. Rubber sleeve (5) seals off brass cylinder (6) so that gas to fill the space in the cylinder occupied by the sticks can enter the cylinder only by flowing upward through the cylinder and past the falling sticks. This upward flow of gas tends to retard the fall of the sticks. If exhausting valve (1) is opened before the sticks are released, a greater quantity of gas will flow up through the brass cylinder past the sticks as they fall and their velocity of fall will be retarded correspondingly.

On January 26, with the assistance of Ralph Hock, R. Vincent Smith, and Francis Archer, preparations were made to treat the tubing and christmas tree of the Cotton Valley Operators Committee Magnolia Merritt 1 well, Webster Parish, Louisiana. A "lubricator," the equivalent of steel nipple (7) was mounted in the tubing-head valve as shown in Figs. 1 and 2. With reference to Fig. 1 the brass cylinder held in the hand of the man on the right (Ralph Hock) was filled with eight sticks of solid inhibitor tied together with cord. An idea of the appearance of the sticks may be obtained from those held in the hands of the man in the center (Francis Archer). The upper half of the Unibolt coupling and the cover of the well-heed magazine is held in the hand of the man on the left (R. Vincent Smith). When the brass tube with the sticks had been inserted into the steel tube and the cover had been bolted in place preparatory to dropping the sticks into the well tubing, the magazine had the appearance shown in Fig. 2.

After well was closed in, the tubing-head gate valve was opened and the sticks were released to fall free. The sticks were heard falling through the 2½-in. tubing and were heard to strike bottom (probably an obstruction at 8,454 ft. depth) after a time of fall estimated to be 25 seconds. The sticks were dropped at 2 p.m. and the well was opened to flow at 2:15 p.m. Beginning at 2:45 p.m. samples of water from a tubing-head trap were taken for a determination of dissolved sodium chromate. The analytical results follow:

Time of sampling	Sodium chromate dissolved
2:45 p.m.	1,200 p.p.m.
3:15 p.m.	820 p.p.m.
4:15 p.m.	220 p.p.m.
5:15 p.m.	1 p.p.m.

When the well was opened to flow the sound of fragments of the sticks striking the christmas tree was heard but it was not indicated that whole sticks (specific gravity = 2.5) had been carried to the surface by the flowing fluid. The 5 lb. of sodium chromate injected provided a corrosion inhibiting solution in the effluent water for approximately 3 hours.

Injection Repeated

On January 27 at 10:00 a.m. the injection was repeated as before except that the well was flowing at the rate of 3.4 million cubic feet of gas per day. The sticks were heard to fall for 29 seconds but were not heard to strike bottom. The well was opened for a flow of 7 million cubic feet of gas per day and the first water sample was collected at 10:15. The sodium chromate content of this and other water samples subsequently taken follows:

Time of sampling	Sodium chromate dissolved
10:15 a.m.	1,390 p.p.m.
10:45 a.m.	16 p.p.m.
11:15 a.m.	10 p.p.m.
12:15 p.m.	1 p.p.m.

The treatment would be effective in corrosion control for approximately 2 hours.

When the sticks were dropped, there was a sound in the christmas tree as though they had caught momentarily on the tubing hanger or the side outlet T-fitting, but the subsequent sound of the sticks falling through the 2½-in. tubing clearly demonstrated that they could be injected against an appreciable flow of fluid.

At 3:40 p.m. on January 27, eight sticks of sodium chromate were dropped into the tubing with the well flowing 3.8 million cubic feet per day. The sticks were heard to strike a christmas-tree fitting and were not heard to fall thereafter. The tubing-head water was deeply colored with sodium chromate within a few minutes indicating that some of the sticks were in the flow stream. After 30 minutes the tubing-head gate valve was closed without difficulty showing that all or part of the sticks had dissolved and all of them were below

(Continued on page 133)

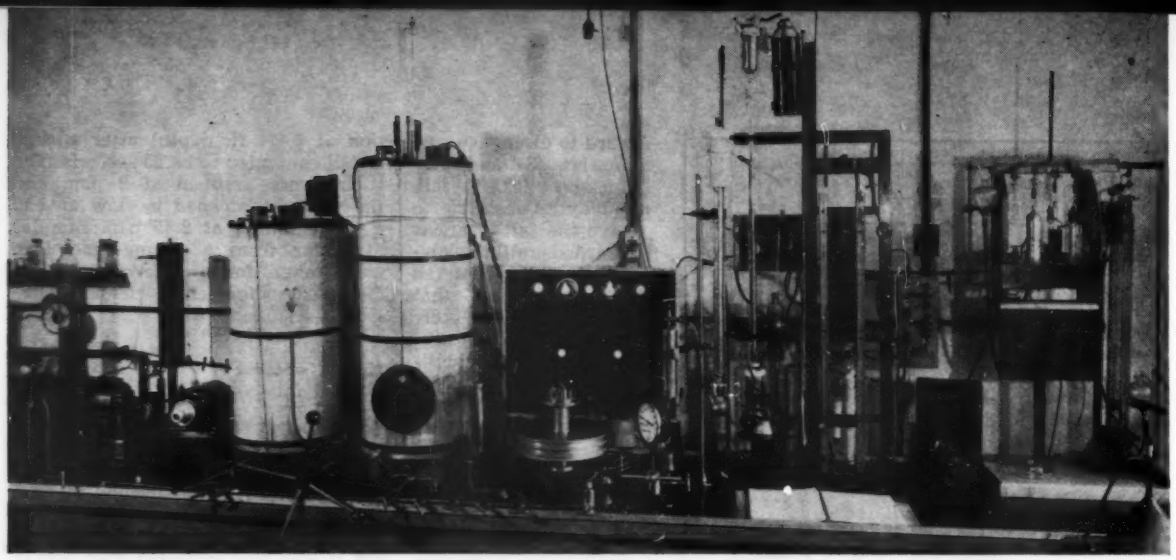


Fig. 1—Vapor-phase equilibrium cell of Houston Laboratories. From left to right: Electric motor and reciprocating pump, mercury reservoir in cylinder in background; compressibility cell and equilibrium cell, with turnstile handle volumetric pump in foreground; dead-weight gage and dial gage in foreground; control panel in back; gas analysis setup

Vapor-Phase Equilibrium Cell Aids Condensate-Field Studies

by Charles J. Deegan

A TYPE of vapor-phase equilibrium cell (see Fig. 1), developed, patented, and in use by Houston Laboratories, is proving valuable in developing information on retrograde-condensate reservoirs. The cell, as it is now operating, has a range of from 0 to 5,300 psia. and from 0° to about 300° F., but modifications expected to be installed soon will extend the pressure limits to around 9,500 psia., and increase the temperature limit to about 350° F.

The normal procedure is for an operator to take companion samples of gas and liquid from a stabilized condensate well, gathered at the separator in a special container, which is shipped to the laboratory. There the samples are transferred to the cell in the separator gas-oil ratio, and the pressure and temperature are built up to duplicate those existing in the reservoir, thus reproducing a true sample of the actual reservoir vapor. There is then available in the laboratory, for experimentation, a duplication of the conditions in the reservoir.

By gradually releasing the pressure, and analyzing samples at various pressures, it is determined what proportions of what liquids and gases will be released theoretically from the reservoir at those pressures, for recovery at the surface.

From this information, theoretical determinations can be made of what percentage of the reservoir's total available liquid products (in the original vapor phase) can be recovered by normal production methods with gradually declining pressures. Other calculations then show what percentage of these liquid products can be recovered by recycling dry gas and maintaining pressure.

A complete test of a sample usually requires about 3 weeks, and ordinarily results in about six charts as illustrated. (See Figs. 2 to 7). The first chart (Fig. 2) illustrates how liquids and gases gradually change from a two-phase system to a single-vapor phase, when pressures are increased

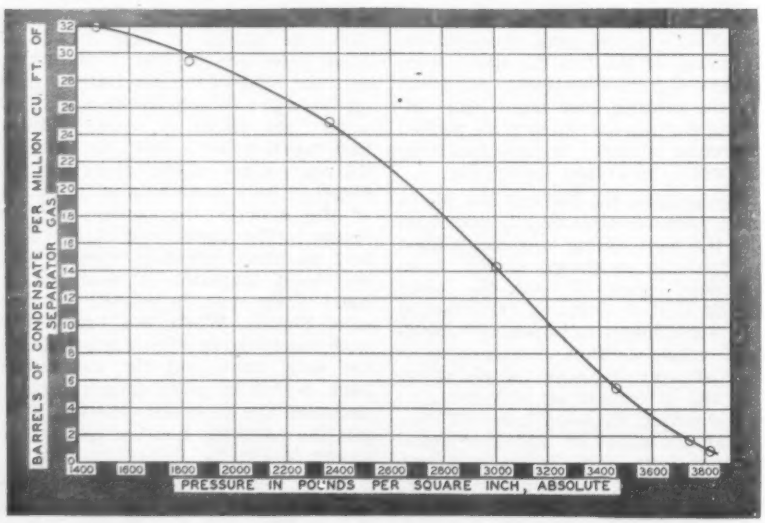


Fig. 2—Liquid accumulation versus pressure at 228° F. or phase distribution of constant weight of reservoir fluid at 228° F.

from about 1,400 to about 3,900 psia., while maintaining the reservoir temperature of 228° F.

The second chart (Fig. 3) gives data on the varying volume occupied in the reservoir by 1 lb. of reservoir hydrocarbon mixture at different pressures, regardless of phase in which it exists in the reservoir.

The third chart (Fig. 4) gives data on how the proportion of various hydrocarbon constituents of the gas, from methane to heptane plus, will vary as pressures drop when the reservoir is produced without pressure maintenance.

The fourth chart (Fig. 5) shows the variation of available gasoline components in the produced gas as a function of pressure drop in the reservoir, expressed in terms of gallons per thousand cubic feet.

The fifth chart (Fig. 6) supplies a basis for an estimate of loss of con-

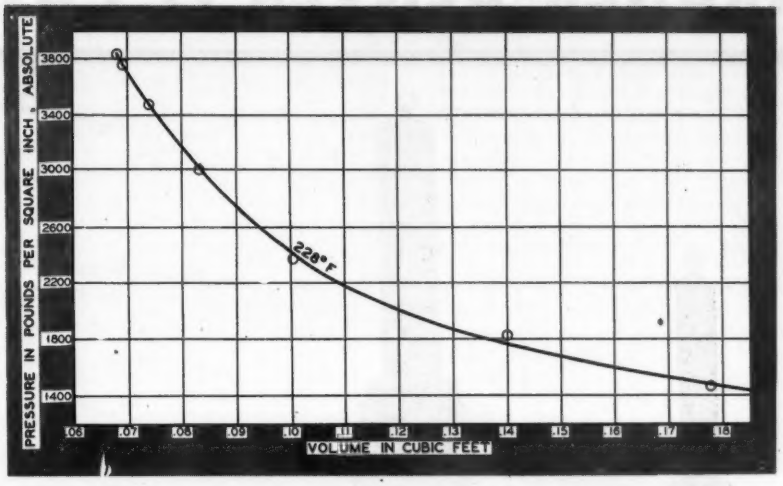


Fig. 3—Pressure-volume relationship of 1 lb. of reservoir fluid at 228° F.

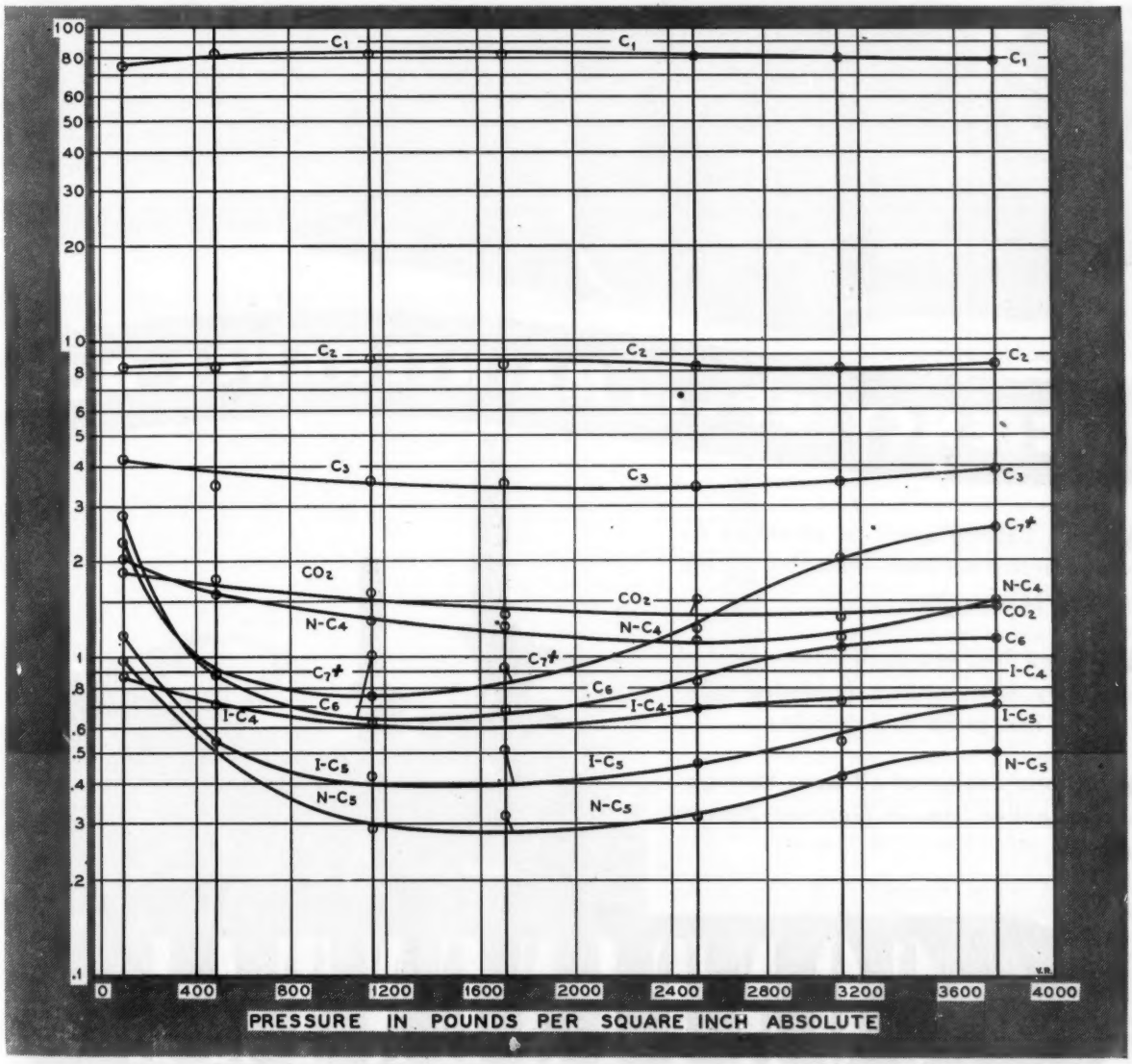


Fig. 4—Analysis of reservoir gas phase hydrocarbon versus reservoir pressure

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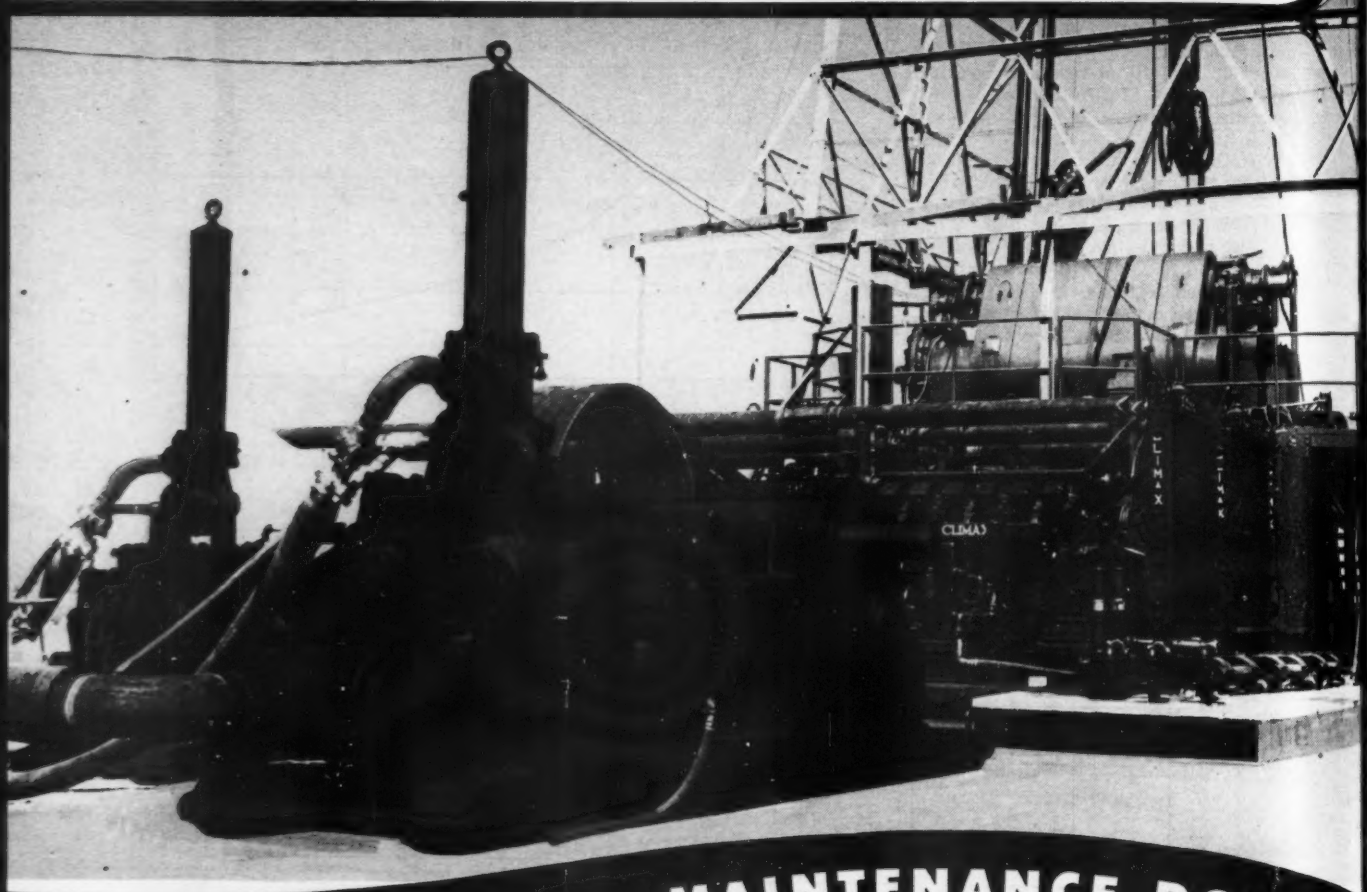

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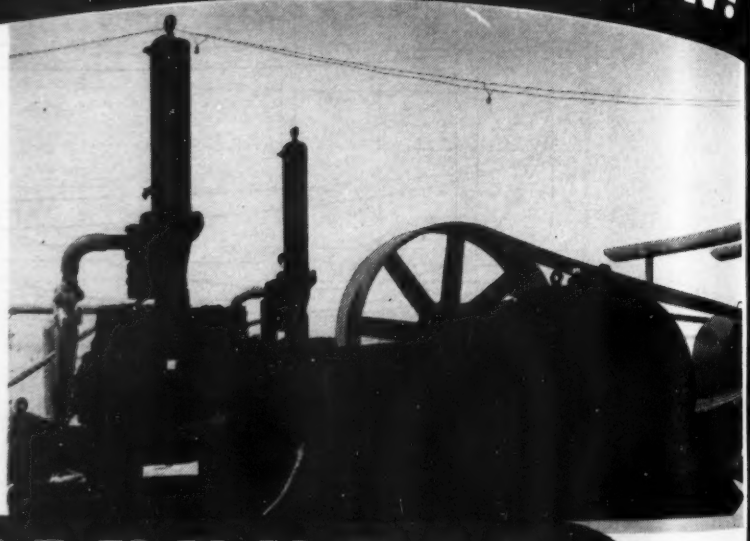

CONTINENTAL

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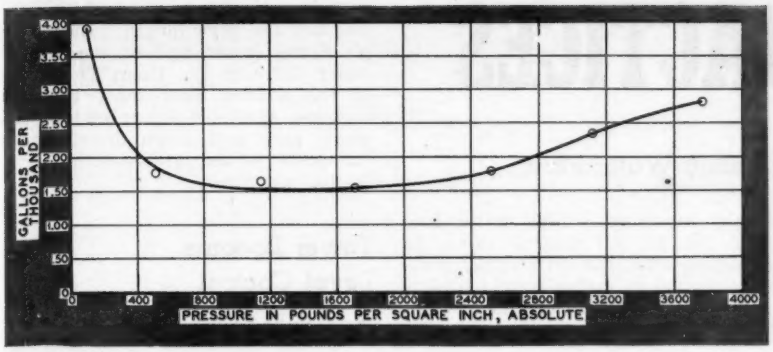


Fig. 5—Gasoline content of reservoir gas phase at 228° F.

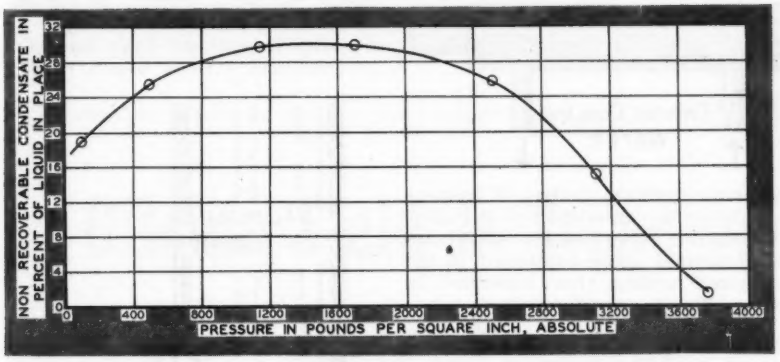


Fig. 6—Total loss of condensate in reservoir from pressure drop due to production without reinjection of dry gas. Temperature 228° F.

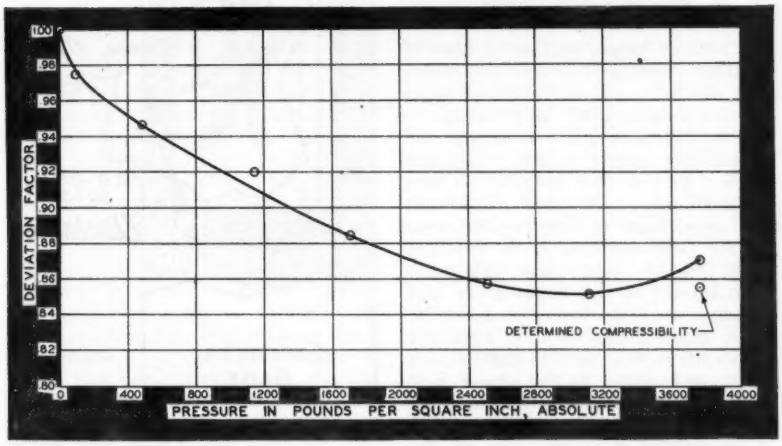


Fig. 7—Calculated deviation factor of reservoir gas phase at 228° F.

densate, due to net retrogradation, if reservoir is produced by normal pressure depletion methods, without any cycling.

The sixth chart (Fig. 7) shows the deviation from calculated volume according to the laws of Boyle and Charles.

After the data are gathered and analyzed, the operator of a condensate reservoir can get a reasonably accurate idea of what to expect in the way of reservoir performance, along the following lines:

A. What pressure is required to maintain a single vapor phase in the reservoir, and change in phase of reservoir fluid with change in pressure. This can be derived from Fig. 2.

B. What percentage of the original reservoir liquid content (existing of course originally in the vapor phase) can be recovered by normal pressure depletion operations. This can be derived from Figs. 4 and 6.

C. What proportionate increase in liquid content recovery can be expected to result from pressure maintenance at any given pressure. This can be derived from Fig. 6.

D. What the proportions of each individual hydrocarbon will be in the reservoir at any given pressure, and how these proportions will change with reservoir pressure changes. This can be derived from Figs. 4 and 5.

E. What type mixture of liquid hydrocarbons will be produced for processing, at varying reservoir pressures, including separate estimates on normal and "iso" butanes and pentanes. This can be derived from Figs. 4 and 5.

F. From Figs. 1 and 7, a basis can be derived for computing the remaining reserves at any given stage of pressure depletion.

Sodium Chromate Combats Corrosion

(Continued from page 127)

the valve. The concentrations of sodium chromate in the water samples taken follow:

Time of sampling	Sodium chromate dissolved
4:10 p.m.	1,400 p.p.m.
4:40 p.m.	32 p.p.m.
6:40 p.m.	16 p.p.m.

The analytical results show that the sodium chromate was present in the effluent water in inhibiting concentrations for approximately 2 hours. It cannot be said, however, that the treatment was effective as the sticks probably did not become dislodged from the christmas-tree obstruction so that they could fall into the tubing.

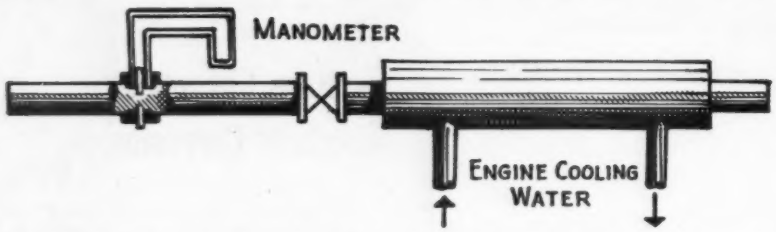
The tests at Cotton Valley proved that sticks of a treating material can be injected into tubing against the flow of fluid when the mean fluid velocity is 11 ft. per second. Many improvements will be necessary to make the treatment a practical one. The well-head magazine can be modified to simplify the method of injection. The sticks can be made longer so that they will be less likely to lodge in the christmas tree in falling. An obstruction can be placed in the tubing at the desired depth to catch and hold the sticks at a level in the tubing where there is certain to be condensed water to dissolve them. The sticks can be coated or impregnated with sodium silicate or other material in such manner that some of the sticks will dissolve immediately and the solution of others will be delayed for several hours.

P. F. Shannon, former manager of Tropical Oil Co.'s Colombian activities and more recently in the Toronto office of Imperial and International Oil Co., has been transferred to New York City to take over foreign producing work there formerly being handled by **Frank L. Fournier** who, in turn, will assume Shannon's responsibilities in Toronto.

PLANT PRACTICES

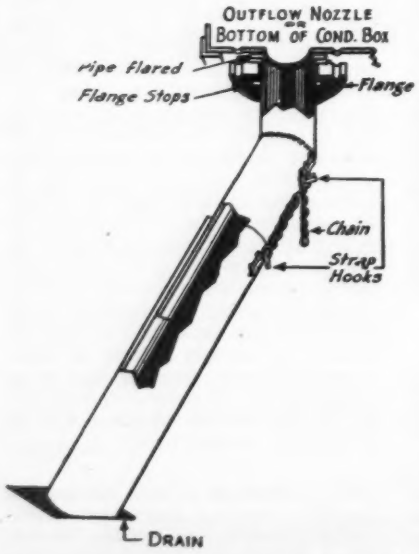
Manometer Control of Engine Cooling Water Flow

CHANGES in pressure especially vary widely the amount of water flowing into water cooler jackets or systems, causing higher temperatures on one hand, excess water used on the other hand. Purely manual control based on observation of variation in temperature entirely leaves much to be desired in operating conditions uniformity and in economy. This is corrected by installing an orifice flange and a mercury manometer in the incoming cooling water line, near the manual control valve. Its presence, after the differential pressure needed to insure proper cooling without a waste is determined by observation, permits the operator to maintain uniform control of temperatures with a minimum of attention to only one indication, the manometer differential's being controlled to the required reading. *(Idea submitted by C. A. Young, operator helper).*



Chute for Removing Waste Wash Water

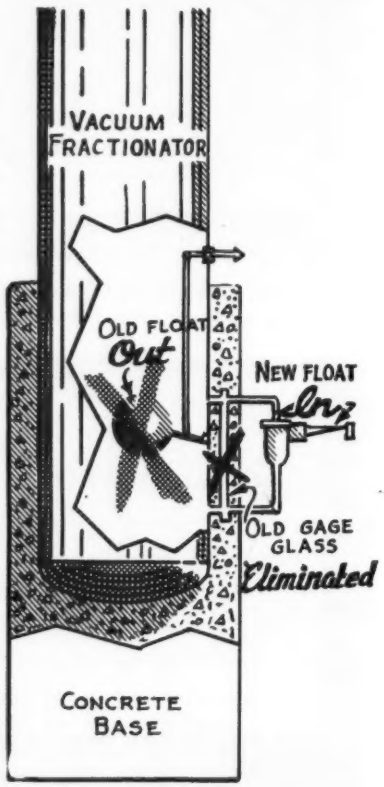
IN washing out box condensers by sluicing with large quantities of water, and in which the water is discharged from the bottom of the box to the sewer opening in the floor of the pump room beneath, and open drain or chute spills much water on the pump room floor. A handy method for handling this waste water is shown in the drawing.



A 1-ft. or longer section of pipe of required diameter to carry the water used, say 6-in., i.d., is welded at angle to a similar piece long enough to reach about halfway from the outflow nozzle of the condenser box to the floor opening. A second piece of pipe somewhat longer than is required to reach the floor opening is used which is slightly larger than the outer diameter of the upper piece and slips over its lower end easily. A plain strap of any available width is bent in a U and one leg is spotwelded to the upper pipe near the angle with its outer leg pointing upward; a similar hook is welded near the top of the lower floating pipe, and a chain is used to fasten these pieces together for easy length adjustment. Near the outer end of the short piece of pipe three metal stops are welded or soldered at 120° intervals, a short distance from end of the pipe. A flange slightly larger than the pipe but smaller than diameter of the circle over the three stops is slipped over the pipe end and the end is flared to hold flange and pipe together but which allows the pipe to turn in the flange. The flange can be bolted directly to the outflow nozzle, and the pipe length adjusted to place the lower end in the waster water drain in the floor. The angle of the welded joint must be such that the extended lower end of the swing pipe will reach directly into the drain. *(Idea submitted by J. J. Daglio, pipefitter).*

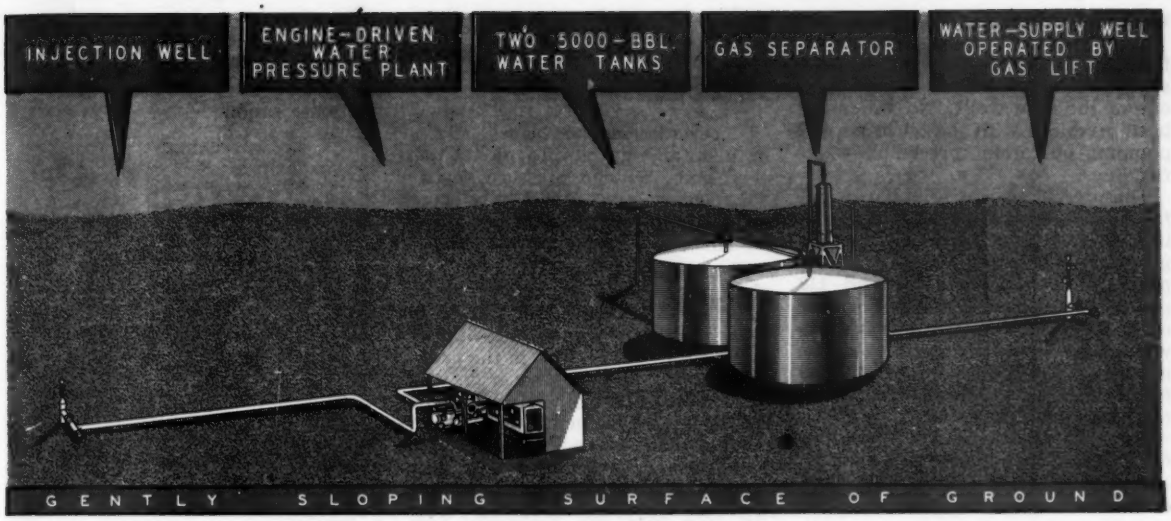
Tower Bottoms Level Control

A TIME-AND-TROUBLE-SAVING device has been developed on a (vacuum) fractionator tower base to maintain bottoms level where formerly the level control adjustment or servicing necessitated an operator working in extreme heat, too high to withstand without health hazard.



The old glass gage column first installed on the bottoms section was eliminated, and the connections into the tower were extended through and beyond the tower's concrete base. A buoyancy type level control was installed through these extended connections to handle the job. This permits repair or servicing the control while the tower is in service, whereas formerly the internal float could not be handled or repaired except during downtimes of the unit. *(Idea submitted by A. L. Evard, instrument technician.)*

These suggestions were submitted in the "Coin Your Ideas" program conducted by Humble Oil & Refining Co.



Increased oil recovery by flank-type water injection will be tested in the Oficina field, Eastern Venezuela, by this system (schematic form)

Oficina Field Is Scene of Venezuela's First Water-Flooding Experiment

by Paul Reed

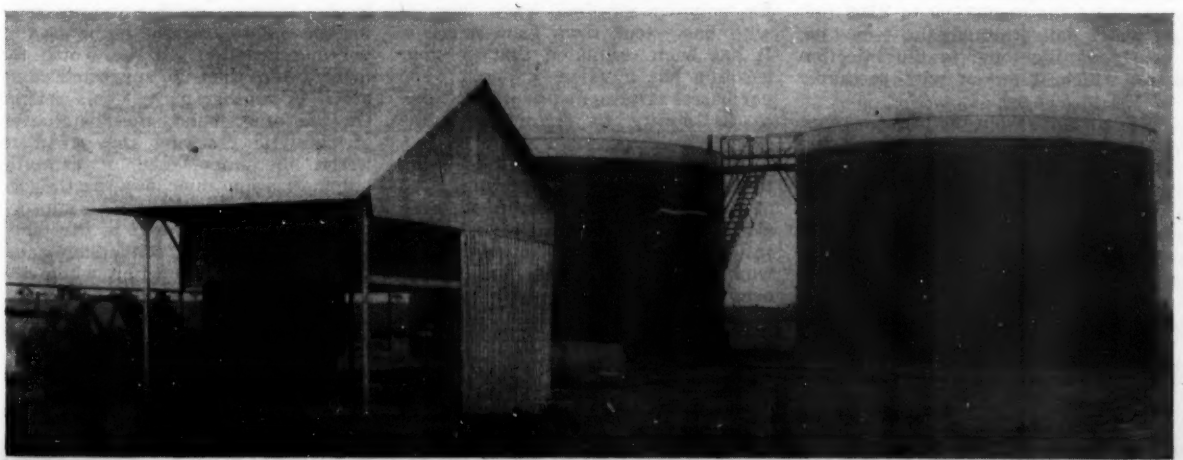
SAN TOME, Venezuela.—Highly significant of the modern scope of engineering studies and conservation work in South America is the first water-flooding experiment in Venezuela. It is being undertaken in the Oficina field near San Tomé in Eastern Venezuela by Mene Grande Oil Co. as a pilot operation to determine whether it is feasible to apply water injection in some of the numerous sand lenses of both the Oficina and West Guara fields. Preparations have been made on a substantial scale to insure that conclusive results may be obtained. The Mene Grande company also has been making preparations for a water-flooding experiment in the Lake Maracaibo area.

The Oficina experiment is to test the possibilities of increasing oil production by water injection in a Miocene sand lens producing at a depth of 5,200 ft. This particular production lens block is designated as the L_1-B segment. It is 1,400 meters long and 900 meters wide, and the reservoir is closed at the top and bottom by tight shale. It is a combination stratigraphic and fault-trap reservoir. The sand lens pinches out rapidly on both the east and west sides, and is cut off by faulting, updip, on the south. Water will be injected close to the original oil-water contact downdip on the north side.

The sand varies through most of the lens from 10 to 40 ft. Permeability varies from 200 millidarcys on the low side to 2,000 millidarcys; porosity is 19 per cent and connate water content is 20 per cent. There was no appreciable gas cap originally in the lens. Crude oil produced is 37° to 38° A.P.I. with a viscosity of 32 to 35 seconds Saybolt at 85° F.

Conditions in the L_1-B segment are similar to those of a larger saturated oil and gas structure in the Oficina field where water flooding may be profitably applied if it appears to be

Pump installation for injecting 3,000 to 3,500 bbl. daily at 400 to 500 psi. at the well head in the L_1-B segment in the Oficina field



successful in the original experiment.

During recent months production from the L_1-B lens segment has been approximately 120 bbl. pumped from one of the nine wells. No water has been produced with the oil in normal pumping operations preceding water flooding.

The present plan is to obtain water for flooding by using gas lift to bring it from a shallow sand 400 ft. thick, producing fresh water with pH 7, 14 p.p.m. of suspended solids and 119 p.p.m. of dissolved solids. For any extensive water flooding in the future which may be carried on it would be possible to use treated water obtained from rivers which provide a plentiful supply in the vicinity.

For the pilot operation, the water for injection will be produced through an abandoned well drilled to the lower part of the structure with surface casing now set through the fresh water sand. The well was originally completed with 7-in. casing to the oil-water contact.

The water-production well was adapted for its present purpose in the following way. Previously 1,500 ft. of 7-in. casing had been cut and removed; a cement plug had been set at 1,431 ft. In accordance with the prevailing custom in the field when the well was drilled, 2,252 ft. of 10¾-in. surface casing was set. (Since then it has been a practice to set only 600 to 1,000 ft. of surface casing.) In converting to water-well service, a cement plug was set at 952 to 922 ft. and the casing was perforated from 644 to 729 ft. and from 794 to 909 ft. with ½-in. bullets. Then a 6⅝-in. liner was run consisting of 307 ft. with ⅛-in. perforations and 571 ft. of blank pipe on top. The annular space between the 6⅝-in. and the 10¾-in. has been gravel packed. A string of 868 ft. of 2-in. was run for injecting gas for flowing through the annulus.

From the supply well the water flows to a separator of a conventional type, placed in an elevated position above the top of two 5,000-bbl. tanks, and into one of which the water flows. One tank serves as a receiving tank while water from the other is being pumped to the injection well. The surface of the water is covered by 6 in. of crude oil in each tank.

An engine-driven 7¼ by 10-in. pump has been installed to move the scheduled input of 3,000 to 3,500 bbl. of water daily through the 4-in. line, nearly a mile long, to the injection well which it enters with pressures of 400 to 500 psi.

The distance from the injection well to the nearest well, which is the one pumping well, is 300 meters. It is expected that only seven of the nine wells on the lens will be affected because the other two wells are located where there is less than 2 ft. of sand. Average spacing of wells at the L_1-B lens is 350 meters.

Poly Plant Converts To Peace

(Continued from page 119)

in maintaining the life of the catalyst beds. Sudden pressure changes on spent catalyst beds have given renewed catalyst activity but it was too short lived to be worth while.

The catalyst is kept stored in a dry place in the packages it comes in until a few days before it is needed for charging to the reactor. It is then mixed with the charcoal in the proper proportion and passed over a ¼-in. mesh hardware cloth to screen out the fines and is sacked in weatherproof containers and kept dry until charged to the reactor.

When the reaction is localized in one bed, that bed becomes "wild" and requires considerable quenching and it is difficult to maintain uniform operation and temperatures. The use of recycle with the charge has made it possible to distribute the reaction through more beds of catalyst. Also, the recycle is used to balance any variation in the amount of feed stock available so as to maintain constant charge rate to the reactors. On the other hand conversion can be seriously retarded by the use of excessive recycle.

There is an optimum velocity at which the best distribution of the reaction over the catalyst bed is obtained. For this reason the use of recycle may or may not be advantageous. Velocity of feed is being maintained at about 2,625 lb. per sq. ft. of reactor cross-section. This gives a pressure drop of about 50 lb. through the four reactors.

At present the propylene and butylenes are 2.5 per cent of the total crude oil run and 86 per cent of these are charged to the polymerization unit. With the new vapor-recovery plant that is being installed the recovery of the propylenes and butylenes will be increased.

It is not certain what catalyst life will be obtained on this polymer operation but the refinery has been obtaining about 140 gal. of product per pound of catalyst on the reactors continued through from cumene and codimer operation.

The blending values shown hold for polymer gasoline when blended with base stock from Kansas crude. It has been estimated that polymer gasoline has a value of about $4.50 per barrel at present price levels, due to its ability to upgrade gasoline stocks.

Several attempts have been made to improve the octane blending value of polymer gasoline. Some of these attempts have been slightly successful but it should be stated that no way has been found to improve the octane blending value sufficiently to make up for any loss in volume of polymer gasoline that may result from the special treatment.

Table 1 lists some properties of the polymer product:

TABLE 1

R.v.p., lb.	9.45
Gravity, °A.P.I.	66.8
I.b.p., °F.	90
5 per cent	118
10 per cent	138
20 per cent	160
30 per cent	195
40 per cent	210
50 per cent	220
60 per cent	230
70 per cent	244
80 per cent	270
90 per cent	324
95 per cent	368
End point	420
Recovery, per cent	97.5
Analysis:	Vol. %
C_4's	12.32
C_3's	5.80
Polymer	81.88
	100.00
A.S.T.M. octane number:	
Clear	83.4
2.0 cc. TEL per gal.	84.1
A.S.T.M. blending value:	
Clear	118.0
2.0 cc. TEL per gal.	114.0
3.0 cc. TEL per gal.	112.0

It has been stated that improved treatment for the polymerization-unit charge is being included in the new vapor recovery unit that is being installed. It is the authors' opinion that treatment of the charge for sulfur removal will give improved polymer gasoline quality without the resulting volume loss occasioned by other treatments which have been examined.

The use of copolymer in gasoline blending allows for the inclusion of some butane in the gasoline during the summer months that could not be included otherwise due to excessive vapor pressures. This advantage is not so apparent in winter when vapor pressure will allow the inclusion of practically all butane production in the gasoline anyway. This is true as butanes have about the same blending value as polymer gasoline as long as vapor-pressure specifications are not exceeded and the loss on the Engler distillation is not too great.

In any event catalytic polymerization is playing an important role in postwar refining. If the refiner finds himself at a place where the polymer gasoline production provides the difference between making and not making the required octane numbers, this polymer gasoline will be worth far more to him than the suggested value given in another part of this article. On the other hand, the installation of catalytic cracking may tend to lessen the importance of catalytic polymerization due to a partial removal of the need for octane improving blending agents and to the tendency toward lower conversion rates on the polymerization unit when catalytically cracked gases are charged.

Deeper Completions Emphasize Need for Improved Casing-Landing Practices

*by John P. DeHetre**

Advances in casing program design technique are contrasted to lack of corresponding improvement in landing practice. Factors in casing landing are discussed; examples given. This article is the principal part of a paper given at the recent A.P.I. spring meeting, Pacific Coast district, Los Angeles.

THERE have been many refinements during the past few years in the methods of casing-program design. All of these improvements have been aimed at tapering casing strings so that a greater percentage of the pipe that is set in the hole is subjected to the maximum allowable stress. This is especially true in long strings of casing since there are practically no operators today that use less than three kinds of pipe in casing strings longer than 8,000 ft. and they may use as many as five or six different weights and grades.

To match this development in casing program design, it is questioned whether there has been a corresponding advancement in landing practice technique. Many old methods that were conceived when wells were only a fraction of their present depths are still being used. However, it would be difficult to make a definite statement that certain ones of these methods are unsatisfactory for particular cases. If more of the failures that have occurred in landed strings of casing could have been retrieved for examination, there is reason to believe that a portion of them could be attributed to an overstressed condition that developed after the pipe was landed.

*Field engineer, The Youngstown Sheet and Tube Co.

Although practically all operators now figure their casing programs much closer than they did 7 or 8 years ago, and they have devoted a considerable amount of engineering thought to program design methods, still a great many of them leave the matter of arriving at a proper landing procedure to the man in the field who, in many cases, does not know the margin of safety that is available in the casing program. He also may not know the pressure and temperature conditions that may be created by future production methods.

It is probably true that a standard procedure of landing pipe can be set up for a particular field where conditions are well known, but it is seriously doubted if any one method can be set up that will be entirely satisfactory to an operator who is drilling in many fields where wide ranges of depths, pressures, and temperatures are encountered. It is therefore believed that the discussion to follow will show the desirability of giving adequate engineering consideration to casing landing procedure for individual wells in new fields until enough is known about the area to establish a standard method.

Because the assumptions affecting landing procedure that must be made in drilling the first well in a new area, are subject to such wide variation, it would not be worthwhile to base concise calculations upon them; but as information is developed, more accurate figures can be made to bring the landing stresses to a minimum. The greatest hazards associated with variations in landing methods occur in long oil strings and protective strings where the safety factors are low and pressure and temperature changes are most likely to be severe. It is with these long strings and a method to aid in arriving at a minimum landing weight consistent with safety that the remarks of this paper are most concerned.

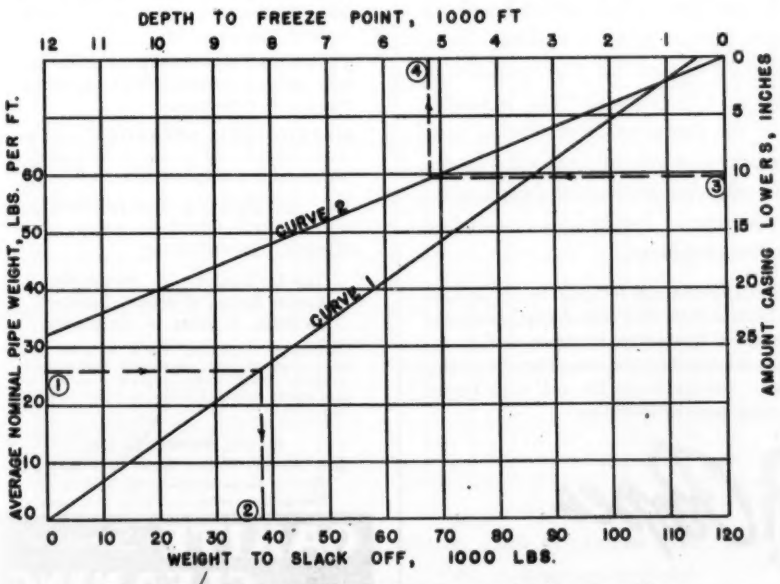

DEPTH TO FREEZE POINT, 1000 FT
12 11 10 9 8 7 6 5 4 3 2 1 0
AVERAGE NOMINAL PIPE WEIGHT, LBS. PER FT.
60 50 40 30 20 10
AMOUNT CASING LOWERS, INCHES
0 5 10 15 20 25
CURVE 2
CURVE 1
1
2
3
4
0 10 20 30 40 50 60 70 80 90 100 110 120
WEIGHT TO SLACK OFF, 1000 LBS.

Fig. 1—Chart for determining depth to freeze point of casing strings

Existing Landing Methods

Listed below are several representative landing methods that have been used:

1. The casing is landed at the exact position it occupied while standing cemented.

2. The casing is landed with a weight which is a certain arbitrarily chosen percentage (a) in excess of or (b) less than the measured weight of the pipe just prior to cementing.

3. The casing is landed with a certain number of inches (a) stretch or (b) slack per 1,000 ft. of casing length, measured from the free hanging position while standing cemented.

In most cases the pipe is allowed to stand cemented for at least 6 hours and many operators wait 24 hours before landing their casing. Recent work[1] has shown the necessary waiting-on-cement time from a strength standpoint to be approximately 10 hours maximum. This amount of time is also shown to be sufficient for the cement to reach its maximum temperature. There are some operators that land their casing as soon as the

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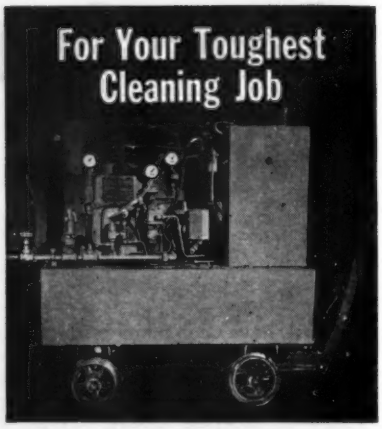

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cement is put away. They, of course, must land the pipe with its full weight, allowing any subsequent temperature or pressure changes to change the load at the head. The matter of temperature and pressure changes will be discussed at more length later.

One danger associated with method (1) occurs when the pipe is rested on bottom to allow the removal of blowout preventers and other equipment prior to landing. In this case the freeze point may move upward while the casing is in compression, and later when an attempt is made to bring the pipe to its original position for landing, a greater stress is induced in the free casing because a shorter length of pipe is stretched the same total amount. It is possible that excessive tensile stresses can be induced by this method, and the operator should watch his weight indicator carefully to ascertain that he does not pull more than the total weight of the pipe before it was cemented.

Danger Seen in Method

Another danger accompanying this method is particularly pronounced in deep gas and condensate wells where bottom hole chokes are used. In this instance an excessive temperature drop may cause a large increase in the tensile loading at the landing head. This load increase caused by a temperature drop added to an already large tensile load of a long casing program can induce stresses of a dangerous magnitude in the upper lengths of pipe.

Each of the other listed methods can also be the cause of trouble under certain conditions, and consequently it is felt that none of these should be used arbitrarily, but they should be varied according to the well. As an example, method (2a) could cause trouble from excessive tensile stress if the over-pull happened to be in excess of the margin of safety for a particular weight and grade of pipe in the string. This is most likely to be the case when a lower grade of casing is used below the top section in the program. This circumstance indicates that the designer of the casing program should always have a hand in the establishment of the landing procedure.

Method (2b) might conceivably cause a bottom portion of the free casing to be in compression (too much slack) if the actual freeze point of the pipe were to be established at a deeper than anticipated point prior to landing the pipe. This condition is most apt to be dangerous when long protective strings are set and considerable drilling is done through the casing. In this case the drilling mud from the deeper hole will be hotter than that in the pipe when it was landed, and this increase in temperature will increase the slack.

Method (3a) might induce excessive tensile stresses, especially when the freeze point moves upward, and method (3b) might cause the pipe to be too slack if the freeze point were higher than expected. Consequently, it is not believed to be advisable to use any method involving definite increments of stretch or slack because the resulting stresses then become a function of the depth to freeze point which is an uncertain and changing figure.

In all discussions concerning casing landing procedure the location of the freeze point becomes a major factor. This is occasioned by the fact that no one wishes to land casing without all the free pipe in tension. It should be stated that the effect of buoyancy of the drilling mud on the weight of the free pipe should not be considered when the lower end of the casing is constrained as when it is cemented or otherwise anchored in the hole.

If all casing landing methods involving arbitrarily chosen amounts of stretch or slack are eliminated, it becomes obvious that the maximum depth to the freeze point becomes the important consideration. The phrase "maximum depth to the freeze point" is used because it is generally considered that the depth of the freeze point will eventually move upward to the approximate depth of the shoe of the next larger casing size, and in many fields this change of freeze point is known to take place in a matter of days or even hours after the pipe is landed. Therefore, if the pipe is landed with sufficient tension to assure the operator that the maximum amount of free pipe will be in tension, the stress on the top joint will not change with subsequent upward movement of the freeze point.

J. T. Hayward[3] pointed out that stretch increments of frozen pipe for known amounts of pull can be used to calculate the depth to the freeze point of a frozen string. Figure 1 has been developed for use in determining the freeze point in the field. This chart is based on a stress reduction of 5,000 psi. in the free pipe. Curve 1

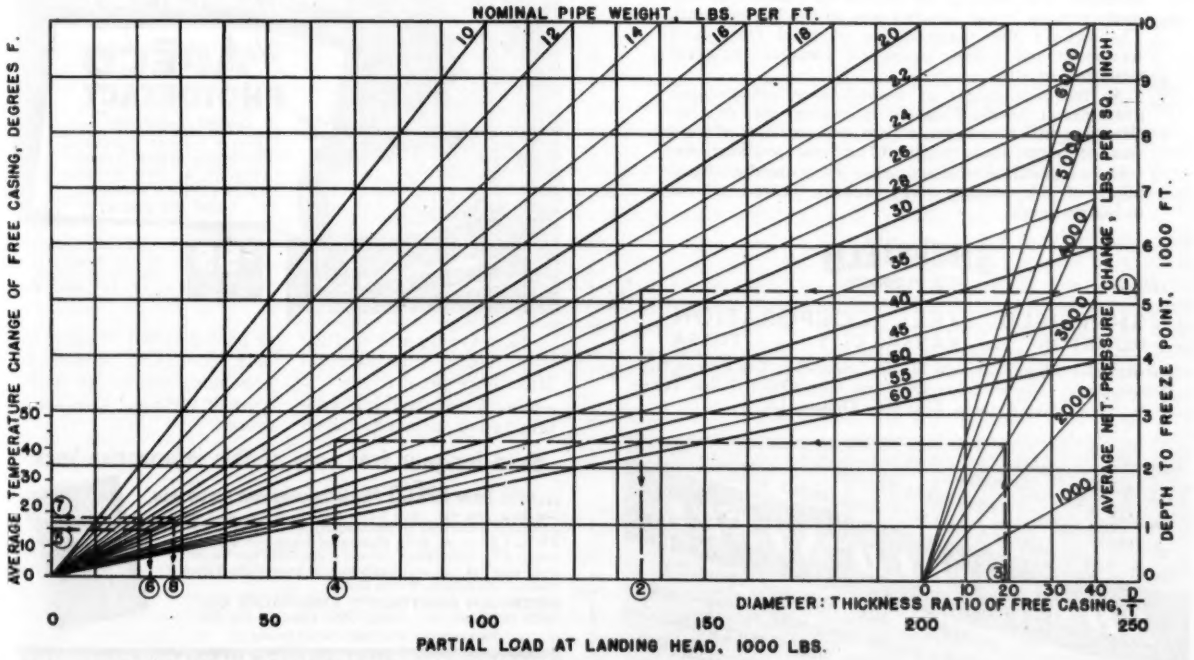
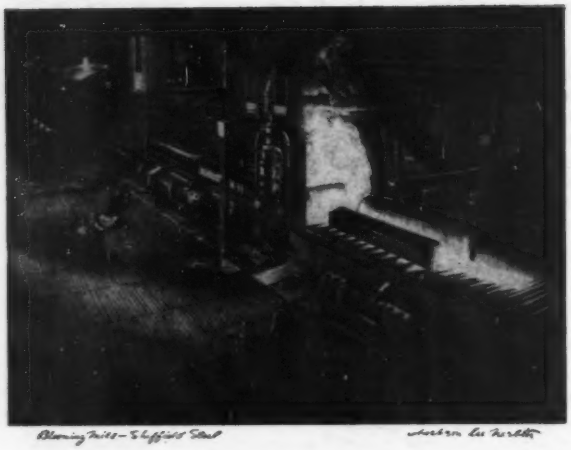


Fig. 2—Landing-weight chart



Blooming Mill—Sheffield Steel — Andrew Loomis

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is a graphical solution of the equation.

$$P = 1{,}445\,W \qquad (1)$$

where

P = Load, to slack off, lb.
W = Average nominal pipe weight above freeze point, lb. per ft.

Curve 2 is a graphical solution of the equation.

$$L = 500\,\Delta L \qquad (2)$$

where

L = Depth to freeze point, ft.
ΔL = Amount casing lowers, in.

The application of this chart will be explained in the example later. Because this chart employs a reduction in load its use is recommended particularly for long strings where tensile loads are already high, and any increase in stretch may be dangerous. Since the curves are based on a stress change of 5,000 psi., the chart may also be used for added tension if this should be desirable in shorter strings. It should be stated at this point that the success of any method involving weight increments depends almost entirely on the accuracy of the weight-indicating equipment, and unless this equipment is accurate within 5 per cent, the results obtained would be of insufficient value to warrant the effort. In the event that the weight indicator is unsatisfactory, the cement point can be determined by a temperature survey checked by cement displacement figures provided the calculator is conservative and establishes the estimate on the deep side so the resulting landing weight will be in excess of the actual weight of the free pipe.

Concerned with the matter of change in freeze point is the problem of removing casing from the landing slips when remedial work is necessary on the well. If a 10,000-ft. string of 7-in. casing consisting of 1,700 ft. of 29-lb. N-80, on bottom and 8,300 ft. of 26-lb. N-80, with long couplings on top is landed with the full pipe weight, 225,000 lb., prior to cementing, the tensile stress in the top length of pipe will be approximately 30,000 psi. and the safety factor on the pull-out strength of the couplings will be 2.05. These figures are based on the total weight of the casing, taking into account the effect of buoyancy of 72-lb.-per-cu.-ft. mud, since the weight prior to cementing would be affected by the buoyancy.

If the freeze point of this casing string should move to a point only 1,000 ft. below the landing head and it requires a 1-ft. movement to release the pipe from the landing slips, this movement would then induce an added tensile stress of 30,000 psi. This would cause the total tensile stress in the pipe wall to be 60,000 psi. or a safety factor of 1.33 on the minimum yield strength of the pipe wall. Stretching this 1,000 ft. of 26-lb., N-80 casing, 1 ft. would require an overpull of 225,000 lb. or a total pull of 450,000 lb. which would result in a safety factor of only 1.02 on the minimum pull-out value of the couplings.

These figures do not consider any average change in temperature or pressure from those at the time of landing, and are pointed out to show that trouble may be encountered when remedial work is attempted, especially if too much tension is applied to the pipe when it is landed.

Effect of Pressure and Temperature

Once the pipe is frozen at the bottom and anchored at the top the only important causes of stress changes are temperature changes, pressure changes, and earth movement. If the average temperature and pressure changes to which the free pipe is subjected are considered, the effect on the weight at the landing head is not a function of the length of free pipe.

The stress induced by earth movement when the pipe ends are constrained is dependent upon the distance between anchor points, decreasing with an increase in length of free pipe for a given amount of movement; but it has been the experience of most operators that if an earth movement of importance occurs, it is useless to consider that any casing program will withstand the resulting loads. As a result, the matter of stresses resulting from earth movements will not be dealt with in this paper.

Cases have been noted where pipe has moved upward in the landing slips because of the injection of high temperature gas into the casing. This same upward movement has occurred in wells where high pressure gas was introduced into the annulus outside the casing in question. In each case the elongating effect of temperature and external pressure was sufficient to overcome that created by the tension that was applied when the pipe was landed. Because of these lengthening conditions, added tension must be applied at the landing head to compensate for them when their existence is anticipated.

Fig. 2 has been developed as an aid in evaluating the effect of temperature and pressure changes on the load at the landing head. The section of the chart devoted to temperature change is a graphical solution of the equation.

$$P = 58.2\,W\,\Delta T \qquad (3)$$

where

P = change in load at landing head, lb.
W = Nominal pipe weight, lb. per ft.
ΔT = Average temperature change of free casing, °F.

When the temperature change is a drop, the effect at the landing head is an increased load; and when the temperature change is a rise, the effect is a decreased load.

The section of the chart which has to do with pressure change is a graphical solution of the equation.

$$P = 0.0434\,W\,\Delta p\,\frac{D}{2} \qquad (4)$$

where

P = Change in load at landing head, lb.
W = Nominal pipe weight, lb. per ft.
ΔP = Average net pressure change in free pipe, psi.
D = Pipe o.d. in.
t = Pipe wall thickness, in.

If the average net pressure change is an external increase, the effect at the landing head is a decreased load, and if the pressure change is an external decrease (internal increase), the effect at the landing head is an increased load.

Fig. 2 also provides a graphical method of arriving at the weight of the pipe above the estimated freeze point. This section of the chart is a graphical solution of the simple equation:

$$P = W\,L \qquad (5)$$

where

P = Weight of pipe above freeze point, lb. (Effect of buoyancy neglected)
W = Nominal pipe weight, lb. per ft.
L = Depth to freeze point, feet or length of each section if there are more than one weight above freeze point.

If there are two or more weights of pipe above the estimated freeze point, each length can be used with the proper pipe weight to obtain a partial weight. The partial weights can then be added to obtain the total weight of pipe above the freeze point. The use of the chart of Fig. 2 will be explained more fully in the example that follows.

With earth movements eliminated from consideration, all of the variables except temperature rise and external pressure increase cause added tension so the necessity of keeping the initial landing weight to a minimum is obvious.

It can be said generally then that the landing weight should be the actual weight in air of the maximum amount of free pipe, plus an amount necessary to overcome the lengthening effect of anticipated temperature increases or external pressure increases that are likely to occur before the freeze point moves upward a substantial amount. If the freeze point is known to move upward rapidly the lengthening factors mentioned probably can be disregarded.

Example Procedure

A method of determining a satisfactory landing weight is shown in the charts of Figs. 1 and 2. Let us assume that the 10,000-ft. 7-in. casing program consisting of 8,300 ft. of 7-in. 26-lb. N-80 with long couplings on top and 1,700 ft. of 7-in. 29-lb. N-80

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with long couplings on bottom previously referred to, is set in an area where the following conditions are encountered:

1. Calculated top of cement from displacement figures—6,000 ft. from the surface.
2. Final freeze point—1,000 ft. from the surface.
3. Average net pressure increase inside the free casing as compared to landing pressure—3,000 psi.
4. Maximum average temperature rise of the free casing after landing, 15° F.
5. Maximum average temperature drop of the free casing after landing, 18° F.
6. Diameter to thickness ratio, D/t of 7-in., 26-lb. casing = 19.34.

It will be assumed that the final freeze point and the temperature and pressure changes listed have been determined from other wells in the area. No attempt will be made in this discussion to go into the mathematics of temperature vs. depth predictions for flowing and static conditions.

The first determination to be made is the location as near as possible of the actual freeze point of the casing at the time it is landed. Some operators have used temperature surveys to locate the top of the cement and this method is probably satisfactory in most cases, especially when the result checks with displacement figures. However, if it is desired to make another check on the location of the freeze point, this can be done by the stretch method of Fig. 1. In the example to be worked out the nominal pipe weight above the calculated cement level is 26 lb. per ft. so a horizontal line is drawn from this value, (1) to intersect Curve 1. A vertical line is then drawn to (2) which yields a weight to slack off of 38,000 lb. This means that the pipe which is hanging cemented in the derrick with the full weight of the string as indicated before cementing should be slacked off in the amount of 38,000 lb. after marking the casing approximately 2½ ft. above the rotary table. In this example it will be assumed that the mark lowered 10⅜ in. so a horizontal line is drawn from this value at (3) to intersect Curve 2. From this intersection a vertical line is drawn to (4) which indicates the depth to the freeze point is 5,200 ft.

With the depth to freeze point established at approximately 5,200 ft., the chart of Fig. 2 can be used to determine a proper landing weight. To obtain the weight of the free pipe, draw a horizontal line from 5,200 ft. at (1) to the intersection of the pipe weight of 26 lb. per ft. From this intersection draw a vertical line to (2) which shows the weight to be approximately 135,000 lb.

The effect of the average pressure change on the load at the landing head may be determined next. Since the diameter-to-thickness ratio of the free pipe is 19.34, a vertical line is drawn from this value at (3) to intersect the diagonal pressure line of 3,000 lb. psi. which is the average net pressure increase inside the free casing for this example. A horizontal line is then drawn to the diagonal pipe weight line of 26 lb. per ft., and a vertical line is then drawn from this intersection to (4) which yields an added load of 65,500 lb. at the landing head. If this average net pressure increase had been outside rather than inside the casing, the effect at the landing head would be a reduced rather than an increased load.

To evaluate the effect of the 15° F. average temperature rise of the free pipe, a horizontal line is drawn from this value at (5) to intersect the diagonal 26-lb. line. From this intersection, a vertical line is drawn to (6) which shows approximately a 22,500-lb. weight reduction at the landing head for this temperature rise. The effect of the 18° F. average anticipated temperature drop can be found by drawing a horizontal line from 18° F. at (7) to the 26-lb. pipe weight. From this intersection a vertical line is drawn to (8) which shows an added weight of approximately 27,500 lb. at the landing head.

With the above figures in mind, a satisfactory landing weight may be determined as follows: The weight of the free pipe, at the time of landing, is 135,000 lb. Since the 22,500-lb. weight reduction at the landing head caused by the anticipated temperature rise of 15° F., is the only variable in this example that tends to cause slack in the casing, it will be necessary to increase the landing weight by 22,500 lb., making a total landing weight of 135,000 plus 22,500 or 157,500 lb.

If the pipe is landed with a weight of 157,500 lb. at the slips, and the added loads of 65,500 lb. caused by the 3,000-psi. pressure rise and 27,500-lb. caused by the 18° F. temperature drop are later imposed, the total load at the head will then be 250,500 lb. This load is equivalent to a tensile stress of 33,200 psi. in the top joint of casing or a safety factor of 2.41 on the minimum yield strength of the pipe. The safety factor on the minimum pull-out strength of the casing couplings would be 1.84. Each of these safety factors is satisfactory although the 1.84 figure is lower than some operators wish to use.

However, if the pipe had been landed with its full buoyed weight of 225,000 lb. before cementing, and the loads of 65,500 lb. and 27,500 lb. were later brought to bear, the total weight at the landing head would then be 318,000 lb. This load would cause a tensile stress in the top joint of casing of 42,200 psi. or a safety factor of 1.90 on the minimum yield strength of the pipe. The safety factor on the minimum pull-out strength of the top coupling would be only 1.45 which is considerably lower than good practice would dictate. Inasmuch as the stress in the pipe itself is not beyond accepted maximums, this problem could be solved by the use of a stronger casing joint.

Conclusions

It is believed that the example will illustrate the need of engineering consideration in the problem of landing casing. Were the depth and tensile loads greater, or the pressure and temperature changes more severe, dangerous stresses would have been induced that would cause casing failures.

Several operators have stated that they intend to install strain gages equipped with recording apparatus on the landing joint of casing so that data can be developed as to the actual variation of the load at the landing head. It is believed that an experiment of this type will bring to light reasons for some of the troubles that have occurred in casing after it has been landed. Reference to the data on biaxial loading in the A.P.I. paper on "Setting Depths for Casing"[3] will show that large tensile loads have a substantial reducing effect on the resistance of casing to burst and collapse, especially when the tensile loads exceed 50 per cent of the yield strength. Taking this into consideration, the reasons set forth in this paper for keeping the landing weight to a minimum without placing any pipe in compression take on added significance.

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BOOKS

OPPORTUNITIES FOR PRODUCTIVE WORK THROUGH MINERAL INDUSTRIES RESEARCH. Circular 20. Published by Mineral Industries Experiment Station, Pennsylvania State College, State College, Pa. 36 pp.

This circular picturizes objectives and organization of the college's experiment station, and discusses research as an essential feature of education, men and equipment, routine testing, research program and accomplishment, publications. Sent free to interested persons.

A BUSINESS OF MY OWN. By Arthur E. Morgan. Community Service, Inc., Yellow Springs, Ohio. 184 pp. $1.

The aim of this book is to be of service to persons considering going into business for themselves, by suggesting possibilities, with illustrations, and by discussing the general aims to be achieved by independent business enterprise. Several hundred small businesses are described or referred to, though some of the most interesting chapters are on the place of small business in American life, and how a young man can be effective in it.

Hydraulic Hoisting Used In Proposed Rotary Rig

by Neil Williams

Working model of proposed hydraulic hoist rig. (Inset) E. J. Shaffer, designer

HYDRAULIC hoisting is employed in the working model of a newly proposed rotary drilling rig. E. J. (Ernie) Shaffer, who for many years has been active in the oil industry both as an independent operator and contractor and as a designer and manufacturer of rotary equipment and tools, is the inventor and has applied for patents.

A radical departure from conventional equipment, the hydraulic hoisting system as applied to the working model has as its essential elements three high-pressure cylinders with their reciprocating lifting plungers, a centrifugal pump to circulate the activating fluid, fluid transmission lines to and from the cylinders, a control-valve arrangement, a primary power source for the pump, and a fluid supply tank.

The hoisting assembly is built into and forms an integral part of the derrick mast (see accompanying picture). In this, two of the hydraulic cylinders with their tubular supports comprise the two front legs of the mast. Use is made of the tubular supports for transmission of activating fluid to and from the cylinders. The third cylinder is suspended by a differential-joint connection, allowing free movement, from the center of a horizontal crosshead connecting the tops of the lifting piston rods which extend upwardly from the hydraulic cylinders forming the mast leg members.

Attached by a hinge-pin connection to the bottom end of the piston which extends downwardly from the center cylinder is a hook of more or less conventional type from which the swivel, kelly, and drilling-string load is suspended in conventional manner.

Operation of the hoist is accomplished by directing the pressure of the activating fluid through ports in the tops or bottoms of the three cylinders in the sequence desired to extend or retract the reciprocating plungers.

The two outer lifts function in unison with both taking fluid pressure simultaneously from a common hydraulic system and discharging jointly to the same fluid-return line. Operation of the third cylinder is entirely independent through a second hydraulic system and control arrangement. Either the middle cylinder or the two outer lifts may be operated alone to raise or lower the pipe in short lengths. When it is desired to handle longer lengths, the full or partial strokes of both the middle and the two outer lifts may be employed.

Synchronization or reciprocation of the piston rods of the two outer cylinders to insure even distribution of the load under all hoisting conditions is accomplished by a rack-and-pinion connection between the tops of the rods. The respective racks in which the connected pinions of each piston rod mesh are attached to guide members mounted vertically as an upward extension to the mast.

Hydraulic fluid is transmitted from a supply header in one circuit to the bottom ends of the two outside cylinders through the bore of one of the hollow legs and thence through a hollow communicating member connecting the bottom inlets. Transmission to the tops of these cylinders is through a pipe supported along the side of one of the hoist legs and thence through a similar communicating member connecting the top inlets.

In a second circuit the fluid is transmitted from another supply header through a flexible hose connection to the bottom inlet of the center cylinder and through a pipe supported along the side of the first leg and a flexible hose connection to the top inlet.

Fluid circulation is controlled by two four-way valves, one in the circuit for operation of the two outside hoists and the other in the circuit for the center cylinder. Each valve has a direct inlet connection from the pump fluid discharge line and three outlet connections, one to the supply line to the bottom inlet of the cylinder or cylinders served, another to its line to the top inlet or inlets, and the third to the central fluid return line. In each case the valve operates in such a way that when fluid supply is transmitted to one end of a cylinder the fluid in the other end is discharged simultaneously to the common fluid return line.

The pump for a full-scale rig preferably would be of a multistage centrifugal type. It takes suction directly from the central fluid supply tank and discharges to the line feeding the two hydraulic circuits. A bypass containing a control check valve is placed between the pump discharge line and the suction side. By adjusting the rate of fluid flow through the valve it is possible to regulate the pressure and volume of fluid to the hoist control valves.

The power source is more or less conventional, consisting of an engine or motor hookup operating through a main power shaft having chain or V-belt drives with suitable clutches to the hydraulic pump and to the cathead shaft. The rotary is driven from a secondary chain-drive from the cathead shaft.

Mounted on a skid-type base, the power drives, engines, pumps, rotary and hydraulic hoist and supporting frame comprise a rig that is largely self-contained. The hoisting mast and its supporting frame is mounted on the base through a pivoted connection which permits the mast and hoisting assembly to be lowered into horizontal position.

PROGRESS IN METALS

by W. L. Nelson
Consulting Engineer

Aluminum Bronze And Corrosion

ALTHOUGH the corrosion resistance of copper-base alloys to petroleum oil and refinery chemicals is fairly well understood, the particular behavior of aluminum bronze is not as well understood. According to Ampco Metal, Inc., in their memorandum JYS-455, aluminum bronze may be used as indicated in the tabulation shown below. The symbol R indicates that aluminum bronze is recommended for the service, RX indicates recommended with reservations which depend on the operating conditions and the demands on the metal, and NR indicates that such alloys are not suitable.

Ammonia solutions	NR
Asphalt	R
Benzene or benzol	R
Butanes	R
Butadiene and butenes	R
Calcium hypochlorite (dilute or cold)	R
Casinghead gasoline	RX
Caustic soda	RX
Chlorinated solvents	RX
Carbon tetrachloride	
Chloroform	
Mono and trichloroethylene	
Chlorex (dichloroethyl ether)	RX
Copper solutions (ammoniacal)	NR
Coal-tar solvents	RX
Benzene, naphtha	
Solvene, zylene	
Foamite solutions	R
Gases (paraffin hydrocarbons)	R
Gasoline, sour	NR
Gasoline, refined	R
Gasoline, aviation	NR
Hydrofluoric acid	RX
Hydrogen sulfide	NR
Hydrochloric acid	NR
Kerosene	R
Lubricating oils	R
Lacquers and lacquer solvents	R
Salt water (sea, etc.)	R
Soda ash	NR
Sodium carbonate	R
Sodium hypochlorite (bleach)	NR
Sodium hypochlorite 5 per cent free from Cl_2	R
Sulfuric acid, 10-75 per cent	RX
Sulfuric acid, 75 per cent and more	NR
Tar	R
Water (all kinds)	R

Metallurgical Terms

Modulus of Elasticity

Modulus of elasticity is defined as the ratio of the load applied to the corresponding movement caused by the load. It is only applied to the behavior of the material in the range in which the material is perfectly elastic. In lay terms the modulus of elasticity is the load in pounds per square inch required to cause a deformation of 100 per cent.

German Stainless for Jet Planes

DATA are presented, mostly in tabular and graphical form, showing the types of stainless steels and high-temperature alloys commercially produced in Germany during the critical period of the war.

Two high-temperature alloys, designated as Tinidur and CMV Special (Cromadur), were developed by Krupp Co. specifically for use as blading material for the gas turbine of the Junkers OO4 Jumo jet plane.

A number of the German steels are very similar to grades produced in the United States, but there are numerous alloys which have not been commercially produced in this country.

The turbine blade of the Junkers jet plane was originally made from a low-alloy heat-treatable grade FK (D) M10 analyzing 0.25 carbon, 3 chromium, 0.4 tungsten, 0.4 molybdenum and 0.2 per cent vanadium. Later the wheel was produced from a steel analyzing 0.30 to 0.40 carbon, 1 chromium and 0.20 per cent vanadium, which was known as grade CM25.

One of the outstanding characteristics of the steels as a class is the extensive use of aluminum as an alloying element in the straight-chromium type of heat-resisting steels.

In the field of ordinary stainless-steel applications the Germans did not develop anything of outstanding importance during World War 2. In general, the research and development activities of Krupp in the field of heat-resistant stainless steels were directed toward steels of lowering alloy content in an effort toward conservation of strategic alloying elements.

The limitations in the available supply of certain alloying elements made it necessary to develop grades where molybdenum, nickel and columbium were either not used or were largely replaced by manganese, titanium and vanadium where possible. Cobalt and columbium appeared to be no longer available for the production of stainless steels and high-temperature alloys.

Abstract of paper by A. L. Feild in Iron Age, Vol. 156, Dec. 20, 1945, p. 60. Taken from March 1946 issue of Materials and Methods.

Effect of Leaded Fuels on Colbalt-Bearing Exhaust-Valve Materials

A SERIES of cobalt-bearing hard-facing alloys has been used for both the seats of exhaust valves and the valves themselves in internal-combustion engines because of their resistance to corrosion, scaling, and erosion at high temperatures. The alloys used in the series of experiments have the following composition ranges: 1.1 to 1.5 carbon, 1.0 to 2.5 silicon, 0.2 to 0.4 manganese, 60 to 65 cobalt, 25 to 28 chromium, and 3 to 8 per cent tungsten.

The effect of varying cobalt content on the scaling and erosion properties in the presence of the combustion of lead-containing fuels was investigated, and the results of these tests (at scaling temperatures, 1,650° to 2,000° F.) show that: (1) the hard-facing alloys containing 1 to 36 per cent cobalt exhibit about the same resistance to scaling in air as do similar materials containing 60 to 65 per cent cobalt; (2) alloys containing 30 to 36 per cent cobalt are about as resistant to scaling caused by the combustion of lead-free fuels as the alloys containing 60 per cent cobalt; and (3) in the presence of the products of combustion of high-lead-content fuel, the relation of cobalt content to amount of scaling or erosion is about the same as when lead-free fuel is burned, except that the scaling is more pronounced in the case of the high-octane gasoline.

From these tests it seems that the cobalt content alone does not determine the scaling resistance; the effect of carbon content has been found to be quite important. In tests involving steels having carbon contents of 0.19 to 1.39 per cent, it is shown that the scaling resistance of 30 per cent chromium steels decreases with a corresponding increase in the carbon content.

Contributing factors to the scaling and erosion resistance of these types of materials have been found to be variation in the tungsten content, and the presence of ferrite and austenite in the valve or valve seat material.

Abstract—H. Cornelius, Stahl u Eisen, Vol. 33, Aug. 17, 1944, p. 529, taken from Materials and Methods, April 1946.

When plastic is applied to wells by the bailer dump technique, specially designed bailing unit, power pumping unit and necessary measuring equipment are used

Plastics in Well-Remedial Work— How an Actual Job Is Designed

by A. C. Polk, Jr.* and D. F. Saurenman†

PLASTICS have received much publicity in recent years in almost all industries. The applications have been so diverse it would be almost impossible to list them. It is sufficient to say they are changing, and will continue to change established industrial procedures and economy.

This article is concerned with the use of plastics in the completion and production of oil and gas wells. In the oil industry there has been continuous research for more efficient and reliable methods and materials for selectively isolating oil and gas producing strata. By this is meant the exclusion of undesirable fluids and gases in producing wells, permitting efficient and economic production of salable petroleum. There are many indications that this use of plastics will benefit considerably the economics of the production of petroleum products.

Specifically, these plastics are used both in primary well completions and in remedial work. The use of plastics in initial completions is confined to the provision of a seal between the casing and the wall of the drilled hole. This may be done by one or both of two methods. In the first, the casing may be sealed or anchored in place with plastics by filling a predetermined section of the annular space between the casing and the well bore by simple fluid-displacement methods. The second method is the placement of plastic at precisely predetermined points through perforations in the casing to isolate or segregate producing zones prior to their initial completion. In some cases a combination of both methods is required to achieve the desired results.

*Dowell, Inc. †Baker Oil Tools, Inc.

Different Techniques Employed

The second and most general use of plastics is in remedial work at the productive horizon, and in work required in secondary-recovery programs. This work is divided into two phases. The first is concerned with operations within the productive zone itself. The second is concerned with isolation of strata capable of producing undesirable fluids, thus permitting recovery of only the desired products. Plastics are efficient in the effective control of high gas-oil and water-oil ratios.

Application of plastics to the numerous and varied problems encountered in remedial work requires that the material and the technique be specifically designed for the immediate problem. This precludes the making of any general statement to cover all conditions and applications. Certain of the more general techniques will be described herein.

The oil industry has shown much interest in the use of plastics. One of the primary reasons for this is that these plastics are true liquids during the time of application and therefore have the ability to penetrate porous media. After placement, the plastic, by polymerization, hardens into an impermeable solid which, for all intents and purposes, is chemically inert. The ability of the plastic in a liquid state to penetrate a porous media provides a method of forming a more effective block or obstruction to the flow of fluids through the porous media. This also provides a positive means of forming a bond between the porous media and the surface of the casing in the well. The high bonding strength to either a porous or smooth surface is a recognized characteristic of most plastics.

In their liquid state, the plastics described in this article are true liquids, with a specific gravity of approximately 1.2, and with a viscosity comparable to S.A.E. 40 motor oil. At the time of its application in an

oil or gas well, its weight will vary from 10 to 12 lb. per gallon, depending upon the additive agents. The material is thermosetting and is entirely dependent upon bottom hole temperatures to control and produce its "set" into a solid. Fluid pressures encountered during the application in no way affect the setting time of the plastic.

The setting time of the plastic is predetermined prior to application, based upon bottom-hole temperature, by the addition of catalytic agents. The setting time can be controlled from 2 to 16 hours. The chemical structure of the plastic permits its use in wells with bottom-hole temperatures varying from 70° F. to 350° F. The compressive and tensile strength of the solid plastic is somewhat greater than neat cement. To date, investigations indicate the solid or set plastic is not altered by age, under conditions in which it is used.

Reference has been made to additive agents used in the plastic. The additives used to control the setting time are simply catalysts, and need no particular explanation. Other additives are fillers. These fillers are inert solids of carefully graded sizes. They are used to control the penetration of the liquid plastic into media of varying permeability. The density and particle sizes of the fillers used assure their suspension in the liquid plastic.

In most applications, the amount of plastic used is very small compared to the total fluid capacity of the well bore. As a result, operational methods, and equipment used, must permit the exact placement of the plastic in the well. Also, due to the small amounts used, and due to the physical characteristics of the liquid plastic, it must be segregated from the fluids in the well during the process of placement.

Many wells have been repaired with plastic using a dump-bailer method of placing the plastic. This method is more generally applicable in wells in which only a portion of the producing perforations is to be sealed off. This saves the drilling-out procedure and reperforating. Using an especially designed dump bailer, a predetermined amount of plastic is dumped across the perforations to be closed. The static head of fluid, usually water, standing in the well bore is then exceeded by the addition of a predetermined amount of fluid to exert the pressure necessary to obtain the desired amount of penetration of the plastic into the offending strata.

When the plastic is dumped into the bottom of the well, the amount used should be sufficient to bring the top of the plastic to the desired point. After the plastic has hardened, the well is ready for production test.

Most wells in the Gulf Coast are cased through the productive zones, and have rather high bottom-hole pressures. Remedial work must be done through the casing perforations provided for production or through other perforations made for the specific purposes of the remedial work. To achieve the desired results, it must be determined just where the plastic must be placed, and the placement of the plastic must be exact. This exactness, of course, is relative, based on past remedial procedures.

A hypothetical, but not unusual, case may be set up to illustrate mechanics of the placement of the plastic, assuming the following conditions:

Well is equipped with 5½-in. o.d. casing and 2-in. tubing. Well is perforated for production over an interval of 10 ft., from 8,000 to 8,010 ft. depth. Bottom-hole temperature is 185° F. The well has been killed, and is loaded with mud weighing 10.2 lb. per gallon. The well is producing an excessive amount of salt water, which is believed to be migrating either upward or downward in channeled spaces outside the casing, and into the casing through the perforations. The problem is to seal off, or isolate the producing zone, blocking the entrance of the salt water.

Equipment Used in Work

The recommendations for this type job would call for the use of 200 gal. of plastic applied by the squeeze technique. The necessary tool equipment for the placement of the plastice is then made upon the bottom of the tubing, and is run into the well. This equipment consists of:

1. **A tailpipe,** of oil-well tubing, about 280 ft. in length. According to the needs of the job, the tailpipe may consist of Saran tubing. This is a plastic tubing and may be needed, dependent upon the mechanics involved. In either case, this tailpipe is connected to the bottom of the squeeze tool.

2. **A retrievable cementer,** or squeeze tool. This tool accomplishes the simple function of forming a seal between the bottom of the tubing and the casing in the well, and of anchoring the tubing relative to the well casing at that point.

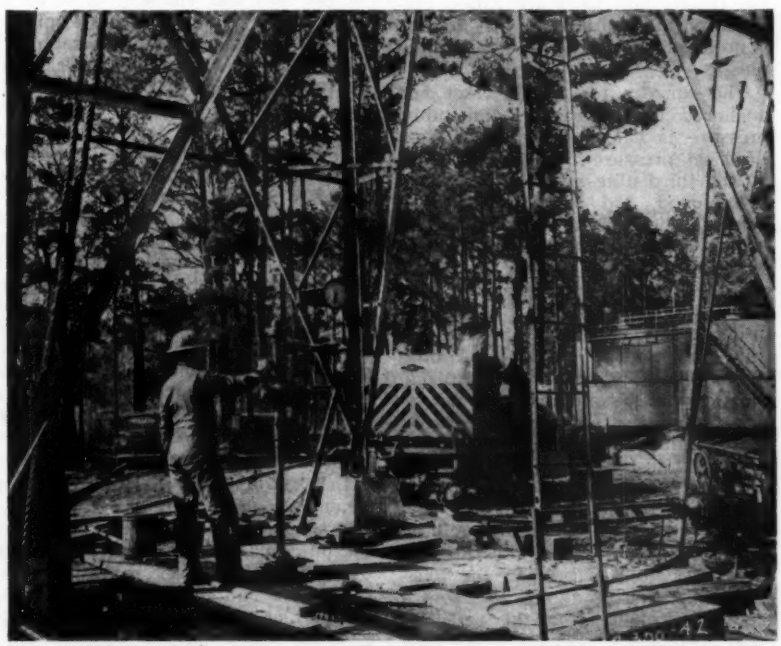
3. **A circulation joint.** This tool provides a "bypass" above the squeeze tool, if such a bypass should be needed.

4. **A "landing tool"** for trapping and holding rubber tubing plugs, which are used in pumping the plastic down the tubing.

In addition, two, three, or four rubber tubing plugs will be used, depending on the nature of each job.

After the tubing with the above described equipment is run into the well, and before the squeeze tool is set, water is circulated through the tubing to clear the mud from the perforated intervals in the casing. The squeeze tool is then set by mechanical means to seal off and anchor in the casing. Pressure is applied, and water is forced into the formation. This is known as breaking the formation down. For this illustration, it is sufficient to say that the breakdown determines that fluid can be forced into the formation, and also

The equipment used in applying plastic by the squeeze method includes a mobile unit containing plastic mixing tanks and a high-pressure injection pump



that after a certain amount of fluid is forced into the formation, it will take more fluid at relatively less pressure. After the breakdown has been applied to the formation, the squeeze tool will be released, and the plastic will be pumped down the tubing. A rubber tubing plug is inserted into the tubing immediately ahead of the plastic and acts as a baffle between the plastic and the fluid to keep the two separate. As soon as the plastic has been pumped into the tubing, another tubing plug is inserted into the tubing, also acting as a baffle behind the plastic. A predetermined amount of fluid is then pumped into the tubing, after which another plug is inserted. Then another predetermined amount of fluid is pumped into the tubing and the fourth plug is inserted. After this, additional mud is pumped into the tubing, proceeding with the displacement of the plastic.

Use of Rubber Tubing Plugs

When the liquid plastic reaches the landing tool, the first plug will be trapped, and the plastic will pass around it and on downward, through the squeeze tool and tailpipe, and into the casing, at the point where the casing contains the perforations. The second and third rubber tubing plugs will also be trapped in the landing tool, and the fluid which was between the second and third plugs follows the plastic downward, assuring that all the plastic is displaced out of all the tool equipment which is on the bottom of the tubing. When the third plug reaches the landing tool, it causes a shutoff, indicating that the liquid plastic is all displaced out of the tubing and tools and is in the casing. At this point, the tubing and tools are raised sufficiently to assure that the tailpipe is no longer in contact with the liquid plastic.

The squeeze tool is then set and anchored in the casing, and pump pressure is again applied. At about 1,500 psi. pressure, the shutoff caused by the third plug in the landing tool is removed, and the fluid confined between the third and fourth rubber tubing plugs is forced downward against the plastic, forcing the plastic out through the casing perforations and into the formation. The measured amount of fluid, between the third and fourth plugs, determines in this case the amount of displacement of the plastic into the formation. When the fourth plug reaches the landing tool it again causes a shutoff, indicating final displacement of the liquid plastic. At this point, the tubing is closed in, at the surface, preventing any movement of fluid in the well during the time for the plastic to "set." When the plastic has set, the tubing and tool equipment are removed from the well, and other mechanical operations are continued to replace the well on production.

Esso 1 State Exemplifies Modern Operation

(Continued from page 117)

though neither sand showed oil or gas when cored and drilled.

Although some fairly hard formations were encountered, drilling on the whole was not unduly difficult as reflected by the fact that down to 7,800 ft. only 57 bits, exclusive of those for reaming, were used. Of these 50 were 9⅞-in. combination drilling-coring bits, used for wire-line coring. Through careful drilling control and by frequent checking of the hole with deviation instruments, maximum deviation from vertical at any place does not exceed 1°.

The drilling program called for exacting control of mud characteristics. However, except for the loose sand and gravel in the first 300 to 400 ft. of hole which created a problem in holding up walls and preventing washouts, no mud-conditioning complications developed. The chief hazard faced lay in the fact that this was a wildcat in virgin territory in which nothing was known of formational conditions ahead or what might be expected. Consequently, mud-conditioning facilities were provided and precautions taken that would permit a high degree of flexibility in mud control and maximum protection against possible trouble.

Details of Mud Control

Below surface formations, mud weight was maintained at 9.9 to 10 lb. per gal. and viscosity from 38 to 45 seconds. Water loss was kept below 15 cc. Use of a Mud-o-graph has made possible a constant check and continuous record of the mud weight. Also a complete viscosity record has been kept on each tour. Water loss and other mud properties have been checked at frequent intervals. The hole had a number of good mud-making sections, but reliance was placed largely on the use of Aguagel with Quebracho and soda ash as chemical to control properties. Because of the excessive quantities of sand and gravel, particularly in the upper part of the hole, provision was made for unusually large settling capacity, including a long baffled return ditch with two steel receiving and settling pits, in addition to the steel suction pit, operated in series.

Drilling of the well culminated an extended surface study of Atlantic coastal plains and Piedmont uplift to the outcrops on the granite, followed by seismograph work in which profiles were run on the granite. The lease block covers approximately 1,440,000 acres, largely state owned, taking the water beds of Pamlico, Currituck, and part of Albemarle sounds, along with Hatteras, Pea, and Roanoke islands and the bordering coastal plain region on the mainland. The location is at the most easterly point that could be drilled on land where the geologic section would be found in its thickening, downdip phase. Although dry, the test has proved the presence of substantial, well-developed sand bodies in horizons that have been prolifically productive in other sections of the country, particularly Mississippi and central Louisiana. Chief of these have been in the Black Creek series, topped at 2,870 ft., Eutaw (not present at the outcrops of this geologic section about 150 miles to the west) at 4,300 ft., and the Tuscaloosa, topped at 4,990 ft.

With the completion of this test, plans call for stacking the rig for a short time while additional geophysical work is done in the light of the information revealed in this test, and then drilling a second test at some updip location farther west, either on the basis of some local structure that might be found in the geophysical survey or on the strength of a possible wedge or stratigraphic trap pinch out of one of the sands.

International Standards For Pipe Threads

PROGRESS in the establishing of an international standard for pipe threads by the American, Canadian, and British Standards Associations is reported to be well under way. Late in 1945 representatives from industry along with those from the various standards organizations of the three nations attended a conference on the unification of engineering standards, at Ottawa, Canada, for discussion on various subjects. Neil P. Petersen, president of Canadian Acme Screw and Gear, Ltd., was chairman of the twelfth session of the conference in which problems concerning pipe-thread unification were discussed.

A proposal by the British delegation recommended the adoption of their standard (BS 21) for the pipe sizes from ⅛-in. to 4-in. inclusive diameters and for the adoption of A.P.I. specification 5L for sizes larger than 4-in. The British proposal along with another prepared by the A.S.A. Sectional Committee B2 were not acceptable to many of those present at the Ottawa conference but continuation of effort to reach an international standard for pipe threads was favored. The economic aspect coupled with disturbances to existing practice involved in reaching an agreement, such as is now under way on pipe-thread standardization, presents a tremendous problem that is expected to be solved in the near future.

Well Interference and Reservoir Drainage

(Continued from page 123)

Reservoir oil in the Arbuckle lime of this area has practically no gas in solution, and produced gas is negligible throughout the life of the field. Original pressure is approximately equal to a hydrostatic head of oil and all production is by pumping.

Water drive has been the active productive mechanism throughout the life of the pool. Presence of the drive is revealed by the steady rise of the water level as oil was withdrawn from the reservoir. Water influx has been sufficient to sustain producing rates and declining oil production is due only to falling oil percentage, for there is no indication of loss in total fluid capacity. The field is almost completely flooded out; oil production of 34 bbl. per day in January 1946 represents only 6 per cent of the total produced fluid, and as of January 1, 1946, 97.6 per cent of the 1,450,000 ultimate recovery had been secured.

Drainage of a large area is demonstrated by 1 Ploog, as unless drainage of considerable area did occur, it could not have produced more oil than did other wells similarly located on structure. This first well had a fairly "low" structural position. Next highest ultimate recovery is the 235,000 bbl. by 3 Ploog, upstructure from 1.

Later "Fill-In" Well Shows Drainage From Offsets

Efficient drainage of wells located on 40-acre spacing in a tight limestone formation is illustrated by the field case shown in Fig. 4. Production is from the Hunton lime at a depth of 3,900 ft. The productive area is about 940 acres. The discovery well was drilled in 1931 and no further drilling was done until early in 1934. Further development was completed by 1936, in an uniform gridwork of one well to 40 acres. The original static reservoir pressure is estimated at 1,725 psi. Initial production of the wells averaged 1,500 bbl. per day after acid treatments; however, until acidized, they would produce very little oil, indicative of the low permeability in the over-all formational mass. No natural water drive has been present.

During the productive period in the Hunton, however, one 40-acre area had been produced only from the Cromwell sand. This well, in 1941, was deepened to the Hunton lime (see map) and completed for an initial production of 101 bbl. of oil per day after acid treatment. Static bottomhole pressure was only 113 psi. This indicated stage of depletion was approximately the same as that in the offset wells which produced throughout their entire life in the Hunton lime. Furthermore, the gas-oil ratio of the late "fill-in" completion was the same as the average gas-oil ratio for the remainder of the field, indicating that oil and gas saturations from the 40-acre tract had reached conditions comparable with those elsewhere in the reservoir.

The direct offset wells to this late completion will have an average ultimate recovery of 166,000 bbl. each and the diagonal offsets will average 117,000 bbl. each in comparison with but 43,900 for the central 40-acre tract where development was delayed. Indications are that if the central tract had not been drilled, the offsetting wells eventually would have economically depleted the tract.

Elmer F. Schmidt, vice president, and **A. W. Breeland,** safety supervisor, Lone Star Gas Co., were elected vice presidents of the Texas Safety Association at the annual convention held recently in Galveston.

George R. Christie, asphalt manager of the eastern marketing division, has been elected president and chairman of the board of directors of the Asphalt Institute.

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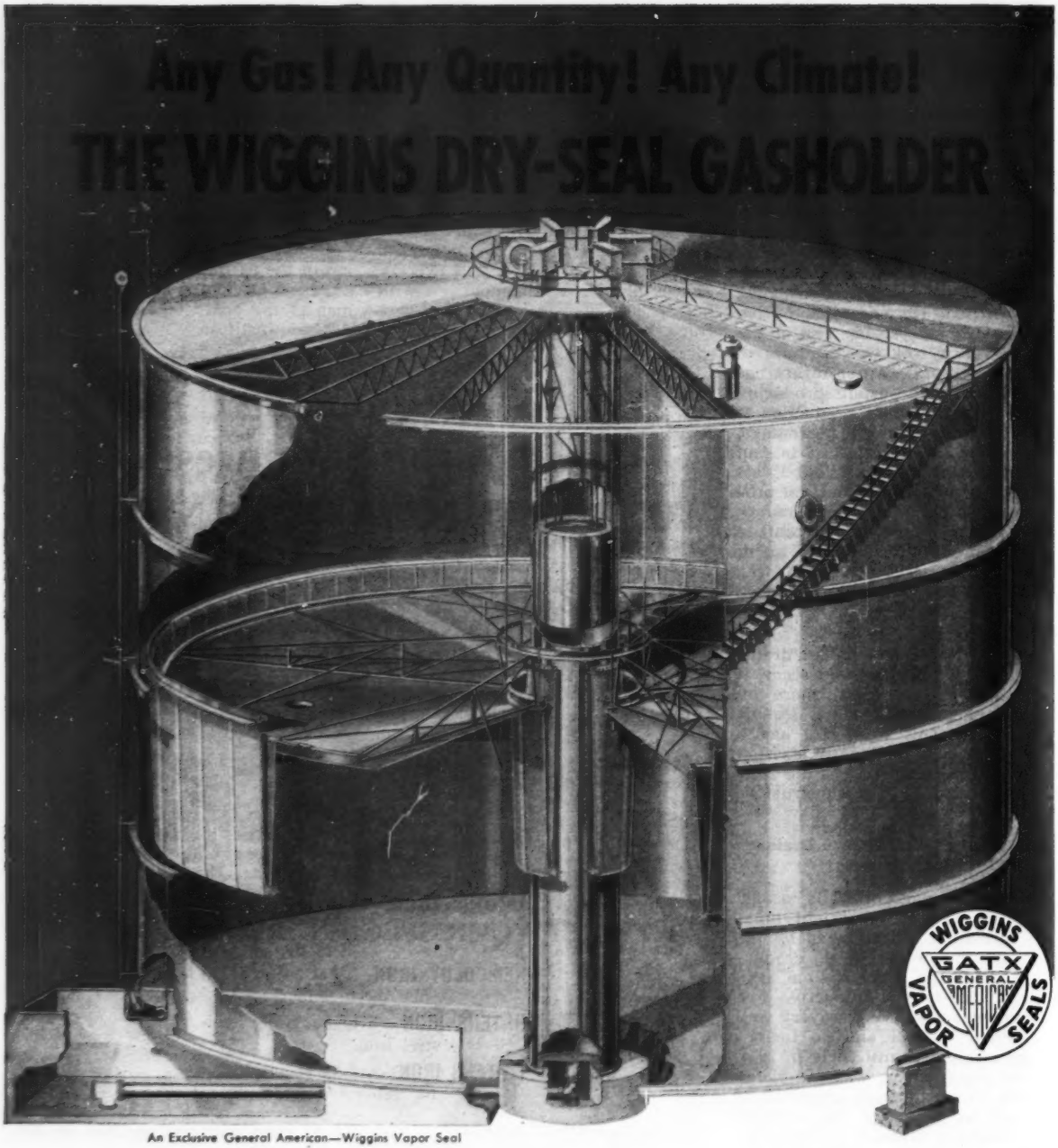

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Engineering Fundamentals

No. 235

A FEATURE OF THE OIL AND GAS JOURNAL

Surveying Instruments—Their Care and Adjustment—1

THE surveying equipment described in Installments 233 and 234 would represent an outlay of about:

Level	$225
Transit	350
Alidade	250
Steel tape	10
Metallic tape	5
Level rod	15
Stadia board	25
Total	$880

Other miscellaneous items would run the cost to approximately $1,000. Such equipment justly deserves proper care to reduce costs of repairs, extend the period of usefulness, and assure more accurate results.

As shown above, the transit, level, and alidade, represent the major portion of the cost of equipment. They should be inspected at frequent intervals by someone wholly familiar with their operation and construction. Should such a person not be available, the instrument should be sent to a reliable instrument repair shop. If none is in the immediate area, it is good practice to send the instrument to the manufacturer. Generally speaking, an instrument need not be sent to the factory for other than major repairs. Such repairs are necessary only after continued use, injuries caused by a fall, or by forcing leveling screws, focusing screws, and adjusting screws beyond the limit of their construction.

Injuries to instruments due to falls can be reduced to a bare minimum by observing a few very simple rules. These are as follows: (1) After removing the instrument from its case preparatory to screwing it onto the tripod, hold the instrument firmly with one hand while the other hand is used to screw the head securely to the tripod. Maintain a firm grasp on the instrument until it is observed that all threads on the tripod have been screwed into the head of the instrument. (2) In walking through doors, passageways, brush, or timber always carry the instrument so that the head is in front of the body. This is most easily accomplished by "cradling" the instrument on the hip. By observing this precaution the instrument is safeguarded from many an accidental blow. (3) When walking on steep hillsides always carry the instrument on the downhill side, either on the shoulder or the hip. This plan leaves the uphill hand of the instrument man free to catch himself and cushion the blow of the fall. (4) When setting up the instrument outdoors where it is not to be used immediately, spread the tripod legs well apart and plant the shoes firmly in the ground.

Lubrication

The movable parts of instruments, particularly those exposed to dust, need occasional cleaning and sometimes oiling. All such parts can be cleaned with a good grade of **white** gasoline. Leveling screws and tangent screws **need no oil** if kept clean since the use of even a small quantity of oil on such exposed parts causes dirt to accumulate. Excessively dirty tangent screws and leveling screws wear extremely rapidly. Such neglected moving parts occasionally become jammed or "frozen" so they can no longer be turned by ordinary methods. Under these circumstances the instrument can no longer be used until it has been repaired. Very little oil is needed on other movable parts such as spindles, clamps, collars, and slides.

Tightening Adjusting Screws

Only experience can teach one how firmly to tighten an adjusting screw. It must be kept in mind that most adjusting screws are small and hence cannot stand much of a twist. When one realizes that they need be tightened only sufficiently to prevent small parts from slipping then he understands that excessive pressures need not be developed.

Adjustment Instructions

Most instrument men are sufficiently qualified to make the field adjustment of transits, levels, and alidades. A good and convenient reference concerning adjustments is given in the small pocket ephemeris published yearly by W. & L. E. Gurley, of Troy, N. Y. This firm will

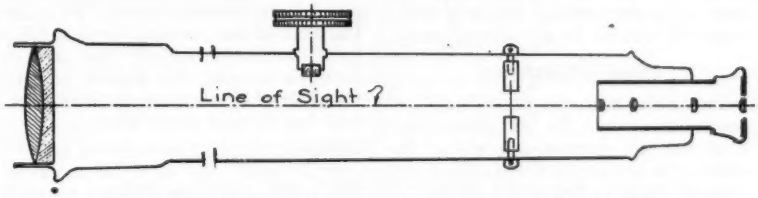

Fig. 1—Cross-section of surveying telescope showing line of sight

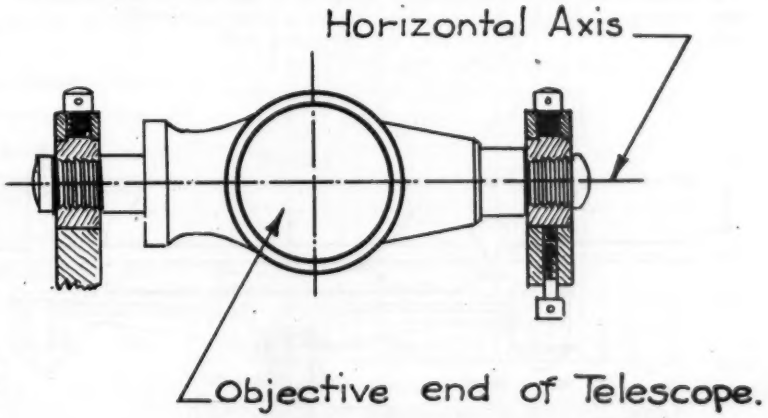

Fig. 2—Partial section of Wye level

Series prepared by Dr. E. A. Stephenson, head of petroleum engineering school, and Prof. D. Don Haines, department of civil engineering, University of Kansas

send one of these pocket booklets upon request. Most manufacturers also publish a manual of field adjustments which may be purchased at nominal cost.

Instructions concerning adjustments of instruments are clear and concise. For example, the third adjustment of a dumpy level is stated as follows: "To make the line of sight parallel to the axis of the bubble tube." This means that the line of sight is to have its position moved so that it will be parallel with the axis of the bubble tube. First the feature which is to be moved is mentioned, and second, the condition which is to be satisfied.

Before adjustments can be made intelligently the instrument man must have a clear understanding of all the terms used in the statement of the adjustment. A few of the most important ones are explained below. (a) **Line of sight** is the imaginary line joining the optical center of the objective lens with the intersection of the cross-hairs (Fig. 1). (b) **Axis of bubble tube** is the line which is tangent to the upper inside surface of the bubble tube at its zero point (Fig. 2). It parallels the longitudinal dimension of the tube. (c) The **vertical axis** (Fig. 2) is the line which defines the center of rotation of the spindles of any instrument. (d) The **axis of the wyes** (Fig. 2) is the imaginary longitudinal line joining the center of the wyes which supports the telescope of a wye level. (e) The **horizontal axis** (Fig. 3) is the line about which the line of sight rotates when a telescope is turned in a vertical plane.

Field Adjustments

The field adjustments which are commonly made by an instrument man for the various surveying instruments are listed below. They are usually made in the order given.

Dumpy level:

1. To make the axis of the bubble tube perpendicular to the vertical axis.
2. To make the horizontal cross-hair lie in a plane perpendicular to the vertical axis.
3. To make the line of sight parallel to the axis of the bubble tube.

Wye level:

1a. To make the axis of the bubble lie in the same plane as the axis of the wyes.

1b. To make the axis of the bubble tube parallel to the axis of the wyes.

2. To make the line of sight coincide with the axis of the wyes.
3. To make the horizontal cross hair lie in a plane perpendicular to the vertical axis.
4. To make the axis of the wyes perpendicular to the vertical axis.

Transit:

1. To make the axes of the plate bubbles lie in planes perpendicular to the vertical axis.
2. To make the vertical cross hair lie in a plane perpendicular to the horizontal axis.
3. To make the line of sight perpendicular to the horizontal axis.
4. To make the horizontal axis perpendicular to the vertical axis.
5. To make the axis of the telescope bubble tube parallel to the line of sight.

6a. (For a transit with vertical circle and fixed vernier). To make the vertical circle vernier read zero when the instrument is leveled and the bubble is centered in the telescope bubble tube.

6b. (For a transit equipped with a bubble tube attached to the vernier of the vertical circle). To make the axis of the vertical circle bubble tube horizontal when the instrument is leveled, the bubble is centered in the telescope bubble tube, and the vernier reads zero.

Alidade: (For tube-in-sleeve type).

1. To make the axis (or axes) of the plate level (or levels) parallel to the plate.
2. To make the vertical cross hair lie in a plane perpendicular to the horizontal axis.
3. To make the line of sight coincide with the axis of the telescope sleeve.
4. To make the axis of the striding level parallel to the axis of the telescope sleeve.

5a. (For alidade with a fixed vertical vernier). To make the vertical vernier read zero when the board is level and the bubble is centered in the telescope level.

5b. (For alidade equipped with a control level attached to the vernier of the vertical scale). To make the axis of the control level parallel to the axis of the telescope level when the vertical vernier reads zero.

Parallax

Before any instrument can be adjusted accurately, or before any observation is made, the instrument should be free from parallax. Parallax is said to exist when, with the eye near the eyepiece and it is moved from side to side or up and down, the cross hairs appear to travel on the object sighted. This is due to the image of the object not falling in the same plane as the cross hairs. Parallax should be eliminated by refocusing the objective of the object, or the eyepiece on the cross hairs, or both. In making the initial adjustments to eliminate parallax the following procedure is recommended. First, pull the objective lens all the way in. Point the telescope toward the sky or some remote object. Then focus the eyepiece on the cross hairs until they appear the clearest—free from fuzz. This need not be at the point where the cross hairs are the darkest but this is usually so. The instrument should then be tested for parallax. If it is found to be present then it likely can be eliminated entirely by carefully refocusing the objective. If this does not correct the fault then turn the eyepiece focusing screw very slightly in one direction or the other. If the parallax increases the eyepiece should be turned in the opposite direction.

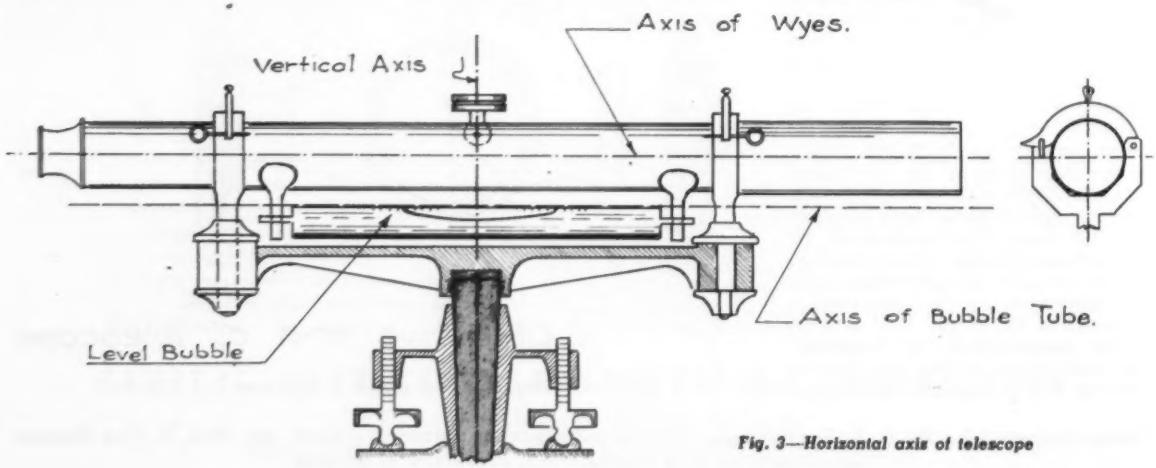

Fig. 3—Horizontal axis of telescope

The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Viscosity of Oils

LOCATE in Table 1 the material most similar to the one whose viscosity you wish to find. The viscosity column is most useful but gravity also has some effect and hence the A.P.I. gravity column should also be noted. A line representing your material is then selected on Fig. 1; it is usually necessary to interpolate between the lines shown. The viscosity in centipoises at any temperature can be read from such a line.

Example.—An oil stock has a Universal viscosity of 60 seconds at 210° F. It will be generally similar to curves 17 or 18. At a temperature of say 350° F., its viscosity in centipoises will range from 0.9 to 1.0, being 0.9 for a low viscosity index oil and 1.0 for a high viscosity index oil.

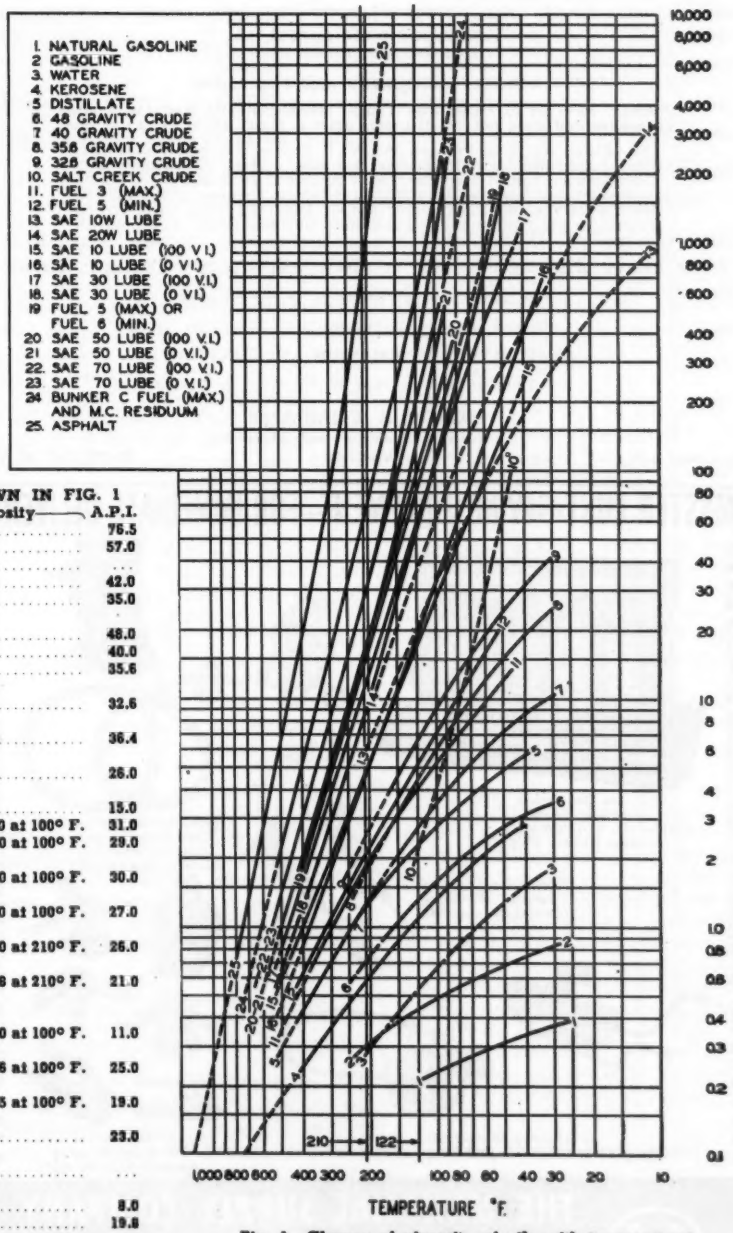

Fig. 1—Change of viscosity of oils with temperature

TABLE 1—PROPERTIES OF OILS SHOWN IN FIG. 1

No.	Kind or type of oil—	Saybolt viscosity—		A.P.I.
1.	Natural gasoline			76.5
2.	Gasoline			57.0
3.	Water			...
4.	Kerosene			42.0
5.	Distillate	37 at 100° F.		35.0
6.	Average light crude oil*	33 at 100° F.		48.0
7.	Average crude oil*	40 at 100° F.		40.0
8.	Average crude oil*	50 at 100° F.		35.6
9.	Average heavy crude oil*	60 at 100° F.		32.6
10.	Salt Creek, Wyo., crude oil†	40 at 100° F.		36.4
11.	A.S.T.M. Fuel 3 (max. vis.)	45 at 100° F.		26.0
12.	A.S.T.M. Fuel 5 (min. vis.)	50 at 100° F.		15.0
13.	S.A.E. 10W lube	10,000 at 0° F.	200 at 100° F.	31.0
14.	S.A.E. 20W lube	40,000 at 0° F.	320 at 100° F.	29.0
15.	Thin S.A.E. 10 lube (100 V.I.)	90 at 130° F.	160 at 100° F.	30.0
16.	Thin S.A.E. 10 lube (0 V.I.)	90 at 130° F.	180 at 100° F.	27.0
17.	Thin S.A.E. 30 lube (100 V.I.)	255 at 130° F.	70 at 210° F.	26.0
18.	Thin S.A.E. 30 lube (0 V.I.)	255 at 130° F.	58 at 210° F.	21.0
19.	A.S.T.M. Fuel 5 (max. vis.) or Fuel 6 (min. vis.)	‡40 at 122° F.	800 at 100° F.	11.0
20.	Average S.A.E. 50 lube (100 V.I.)	90 at 210° F.	985 at 100° F.	25.0
21.	Average S.A.E. 50 lube (0 V.I.)	90 at 210° F.	2,115 at 100° F.	19.0
22.	Thick S.A.E. 70 lube (100 V.I.)	150 at 210° F.		23.0
23.	Thick S.A.E. 70 lube (0 V.I.)	150 at 210° F.		...
24.	A.S.T.M. Fuel 6 — Bunker C (max.) and M.C. residuum	‡300 at 122° F. 300 at 210° F.		8.0 19.8
25.	Asphalt	50 penetration		...

*Mid-Continent, Illinois, California and most other crude oils. †Example of several Wyoming and Texas crude oils which have maximum change in viscosity. ‡Furol viscosity—all others are Universal.

No. 93 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

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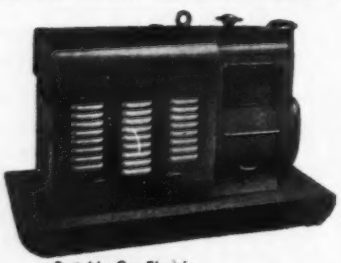

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Natural Gas

Higher Gas Prices Studied By Oklahoma Commission

OKLAHOMA CITY. — Prices paid for natural gas in the Oklahoma section of the Hugoton field and methods of metering the gas were attacked by the Peerless Oil & Gas Co. last week in 3 days of testimony before the Oklahoma Corporation Commission.

Later in the week the commission cut short the hearing and ordered it continued until July 9. In a three-point application, Peerless is asking the commission to set a price of 10 cents per 1,000 cu. ft. for gas in the field, to require purchase of gas at atmospheric pressure, and to order Cities Service Gas Co. to make a connection at a Peerless well.

During the hearing, W. D. Weidlein, St. Paul, Minn., president of Mid-Continent Natural Gas Transmission Co., said he is negotiating a contract with Peerless for all gas on its Hugoton field acreage at 6 cents per 1,000 cu. ft. Mid-Continent Natural Gas is now seeking authority from the Federal Power Commission to build a pipe line from Hugoton field to Kansas City.

Weidlein was crossexamined at length by R. E. Cullison, Cities Service attorney, who repeatedly asked if it was the intention of Mid-Continent to "grab" the Kansas City market from Cities Service. Weidlein indicated the company will bid for the Kansas City market but asserted it will not attempt to enter the Wichita, Kans., marketing area.

The hearing has raised the moot issue of whether the Oklahoma commission has the power to determine gas prices. W. J. Armstrong, one of the commission members, contends a fair and reasonable price goes hand in hand with conservation. Cities Service is challenging the commission's authority to fix prices for products going into interstate commerce and is also protesting the commission's procedure in the case.

On the metering issue, Kenneth Ellison, Oklahoma City, geologist-engineer, told the commission that Oklahoma operators lost an estimated $942,792 in income last year because of the metering method. He recommended use of the so-called Bureau of Mines method accepting pressure at 14.73 psi. Unreported gas, due to the method of metering, totaled an estimated 23,569,812,000 cu. ft. last year, he said.

Another witness, M. L. Mayfield, Houston engineer, said present prices of 4 to 5 cents per 1,000 cu. ft. constitute "economic waste." Compared with coal prices in the Kansas City market area, he said gas should bring 25 cents per 1,000 cu. ft. to compete with coal and 31.5 per 1,000 cu. ft. to compete with the price and costs of fuel oil.

United's Plant to Begin Operations This Month

SHREVEPORT.—United Gas Pipe Line Co.'s new absorption gasoline plant at Carthage, Tex., is scheduled to go into operation this month as the final phase of the company's East Texas development project.

The plant is designed to process completely 100,000,000 cu. ft. daily and partially up to 50,000,000 cu. ft. daily. Gas enters the plant through a gathering system totaling more than 100 miles and tapping the production of 81 wells in the Carthage field. After processing, gas goes to the four-unit dehydration plant before entering the company's main pipe line system.

From the dehydration equipment, gas enters the 24-in. Carthage-Sterlington pipe line which operates on the discharge pressure from the plant. Construction of the project was by Stone & Webster Engineering Corp. with R. M. Wood as superintendent. C. W. Hollenshead was engineer in charge of construction for United, and J. D. Hilburn was resident engineer.

Average daily recovery of the absorption plant is estimated at 150,000 gal. of such products as motor fuel, gasoline, kerosene, liquefied petroleum gases, naphtha, and other products. The products will be moved to market by tank cars, loaded at a 24-car rack, and by tank truck.

Columbia Gas & Electric Proposes Company Merger

PHILADELPHIA. — Columbia Gas & Electric Corp. has filed with the Securities and Exchange Commission a proposal to merge six of its gas subsidiaries into two companies.

Under the plan, United Fuel Gas Co. will absorb Warfield Natural Gas Co., Huntington Development & Gas Co., and Point Pleasant Natural Gas Co. Central Kentucky Natural Gas Co. will acquire Cincinnati Gas Transportation Co.

Natural Gas Sales Drop 0.9 Per Cent in March

NEW YORK.—March sales of natural gas decreased 0.9 per cent, according to the American Gas Association which stated that the decrease showed March 1945 sales of 2,108,336,000 therms compared with 2,089,722,000 therms for March of this year. The Association's natural-gas sales index for March was 182.5 (1935-39 = 100.0).

For the 12 months ending March 31, 1946, natural-gas sales totaled 21,920,952,000 therms, compared with 22,521,537,000 therms for the same period in 1945, or a decrease of 2.7 per cent.

One therm equals about 100 cu. ft. of natural gas.

Report Slated in Several Weeks on Louisiana Tax

BATON ROUGE, La.—A report for the governor and state legislature on the proposed 2½-cent increase in Louisiana's natural-gas gathering tax was promised "in several weeks" following the close of a 5-day special hearing by the state Revenue Code Commission.

H. Alva Brumfield, chairman of the commission which conducted the prelegislative hearing on the proposal, said it would take some time to study the evidence submitted and prepare the report.

One of the later witnesses before the hearing came to an end here last week was Wade O. Martin, Sr., state public service commissioner, who said he had learned to not "take for granted" statements by gas industry representatives.

This prompted Allen Scholars, one of the industry attorneys, to remark: "I don't think we have to take for granted everything Martin says either."

Martin challenged statements of gas industry representatives that they could not afford to absorb and would have to pass on to consumers the proposed boost. The preponderance of testimony, however, was in opposition to the tax. Officials of gas companies and other industries told the commission it would hinder growth of Louisiana industry. The proposal was advocated by P. A. Frye, state gas conservation director, as a means of conserving gas, particularly to curb its export to coal-producing states.

Carbon Plant Proposed

AUSTIN, Tex.—The application of Charles Eneu Johnson & Co. to operate a carbon black plant in the South Caesar field, Bee County, using gas now being flared, has been set for hearing June 18 by the Texas Railroad Commission.

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REFINING

Northwest Refining Opens New Mississippi Terminal

MINNEAPOLIS, Minn. — Ceremonies attended by state and city officials were held recently to observe the arrival of the first crude brought here by barge for the 5,000-bbl. daily capacity refinery of Northwest Refining Co. in St. Paul Park, Minn.

Oil is now brought to the company's newly completed river terminal which includes a floating dock capable of emptying six barges simultaneously at the rate of a tank-car load every 90 seconds. The crude moves to the tank farm through a 14-in. pipe line.

Alfred Erickson, company president, said the operation has made the company one of the largest shippers of oil on the upper Mississippi River. Crude moves to St. Louis from the Wyoming-Montana region by pipe line and from St. Louis it is barged here. The oil is used to produce principally fuel oil and asphalt.

ICC Allows Lower Rates From Wyoming, Montana

WASHINGTON.—The Interstate Commerce Commission has rejected protests of 16 Mid-Continent oil companies and allowed reduced rates on refined products from Wyoming and Montana to the northern marketing area to take effect.

The reduction applies to refined oil, fuel oil, and asphalt and became effective May 7. It applies to shipments from Wyoming and Montana points to North and South Dakota, Minnesota, Wisconsin, Iowa, and Nebraska.

In opposing the reduction and asking for suspension of the new rates, the 16 companies operating in Kansas, Oklahoma, Texas, Arkansas, and Louisiana said they encountered intense competition in the area from Wyoming and Montana marketers and that the proposed rates violated what they called the commission's ruling that rates should be lower from the Mid-Continent area than from the western states.

Another development in the petroleum freight rate situation last week was a statement by Douglas Orme, traffic manager of Cosden Petroleum Corp. in Big Spring, Tex., that the company is not opposing the general application of the railroads for a rate increase. Most other inland refineries are seeking to block the increase or delay it pending a full hearing. Orme said Cosden's position is that it will not oppose rate adjustments which will permit the carriers to operate economically and efficiently and remain under private management and control.

New Engine and Turbine Bulletins Available

WASHINGTON.—A method for igniting internal combustion engines without the use of spark plugs developed during the war by German engineers, is described in a report available from the Department of Commerce. Known as the "ring-process," it was designed to eliminate ignition difficulties in aircraft engines at high altitude.

Diesel engine improvements made in 1943 and 1944 on the German Marco Polo engine, including 62 drawings,

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The Oil and Gas Journal
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are discussed in another department report.

Chemical and physical properties of alloys useful in the construction of gas turbines operating at 1,350° to 1,500° F. have been tabulated in four reports released by the department's publication board.

New Synthetic Oil Made From Hydrocarbon Gases

CHARLESTON, W. Va. — A new synthetic oil made from natural and other hydrocarbon gases and reportedly able to withstand temperatures ranging from —40° to 470° F., is being manufactured by Carbide & Chemical Corp. at its plant near here.

Development of the oil was undertaken more than 10 years ago at the Mellon Institute of Industrial Research in Pittsburgh under fellowships sponsored by the company. Further work was done at South Charleston and at the Tonawanda, N. Y., laboratories of Linde Air Products Corp., a unit of Union Carbide & Carbon Corp.

Carbide & Chemical Corp. scientists claim the oil is wax-free and does not form sludge, gum, and varnish but actually dissolves these substances. The oil, they say, may make seasonal oil changes unnecessary.

On the other hand, they emphasize they do not regard it as a "permanent" oil and concede it is more expensive to produce than any petroleum lubricants. Extensive tests already have been made, including some in Army aircraft and vehicles, and two experimental marketing areas in Midstate New York and Central Virginia have been set up.

Low-Cost Process Claimed For High-Octane Gasoline

WASHINGTON.—A new refining process, said to yield 90 per cent pure polymer product of from 85 to 92 octane from unfinished products or by-products, was claimed by Potomac Hydrocarbons Process Co. of Washington. Purpose of the new process is to produce high-grade gasoline on a small scale at a cost low enough to permit the small refiner to compete with the large catalytic cracking units.

Three radically different features claimed are a continuous upward stream flow, thus preventing accumulation of heavy hydrocarbons. Use of radioactive energy in the form of a catalyst tube containing carnotite ore possessing approximately 3 per cent uranium; electrical charges from the ore bombard the gas stream to make the gases receptive to the action of solid catalysts, and the use of 1,020° F. heat and 100 psig. pressure.

Company engineers said the process could handle as charging stock, crude, oil, waste refinery gas, gas oils or low-grade gasolines.

Reforming Unit Installed In Manitoba Refinery

BRANDON, Man. — Installation of a combination second coil and reforming unit has recently been completed in the 2,000-bbl. daily capacity refinery of Anglo-Canadian ils, Ltd., here.

Approximate cost of the unit, including the changes required with the heavy oil unit, was $80,000. The unit was designed by Universal Oil Products Co., Chicago. Engineering and construction were completed by the company staff, according to R. J. Christian, general manager. In addition to its crude charge capacity, the Anglo-Canadian plant has a total cracking charge of 700 bbl. daily.

Sunray Takes Over Plant

LOS ANGELES.—Richard L. Johnson, superintendent of the Sunray Oil Co. refinery at Santa Maria, Calif., recently purchased from Bell Oil & Refining Co., has assumed full control and has the plant operating to capacity. Plans have been completed for the erection of some additional tankage to permit greater flexibility and more efficient operation.

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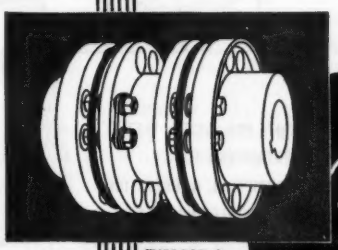

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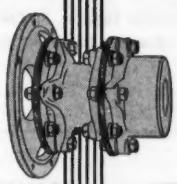

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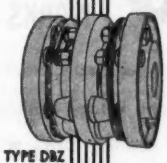

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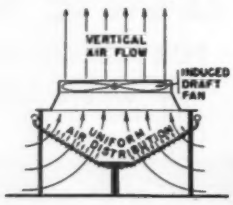
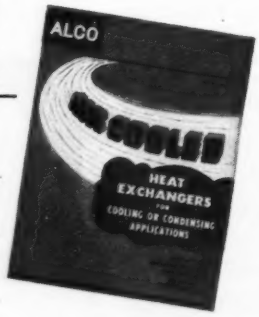
Each of the battery, shown at right, cools jacket water for a diesel engine pipe line compressor and is designed to operate at 100° F. maximum air temperature. The diagram below shows how the uniform air distribution, induced draft operation, and vertical air-flow principle in ALCO Air-Cooled Heat Exchangers permit high efficiency at all times, regardless of wind direction or velocity.





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PIPE LINES

Warren Constructing New South Texas Pipe Line

HOUSTON.—Construction of a $2,000,000 project embracing an 82-mile 6 and 8-in. welded products pipe line and additional storage facilities is under way in the Houston area by Warren Petroleum Corp.

The pipe line, in the Houston products pipe line system of the company, extends from Superior Oil Co.'s cycling plant in the Lake Creek field, Montgomery County, to Warren's tidewater terminal at Norsworthy and from Norsworthy to Texas City where Warren is installing a new tidewater terminal.

The section of the line from Superior's plant to Norsworthy includes about 29 miles of 6 in. and about 21 miles of 8-in. line. This part of the project is scheduled for completion in about a week. The 6-in. section of the line from Norsworthy to Texas City is about 32 miles in length and crosses the Ship Channel through a tunnel at the plant of Sinclair Refining Co. This remaining part of the line is due for completion in about 2 months. Associated Contractors and Engineers, Houston, has the pipe line contract.

At Norsworthy and at Texas City, Warren is erecting an additional 100,000 bbl. spheroids and a number of tanks for liquefied petroleum gases. The larger 8-in. section of the pipe line from Lake Creek field to Norsworthy is designed to handle products from plants which may be built in the area later.

Premier Oil & Refining Buys West Texas Lines

FORT WORTH.—Premier Oil & Refining Co. has bought 96 miles of the West Central Texas pipe-line system of Texas Pacific Coal & Oil Co. to meet the crude needs of the 3,400-bbl. daily capacity refinery operated by Premier in Fort Worth.

A total of $100,000 cash was reported paid for the lines. Included were 36 miles of trunk and 60 miles of gathering system in Young, Stephens, and Palo Pinto counties. The Texas Pacific system has handled 30,000 bbl. of crude monthly.

Ohio Standard Building 240,000-Bbl. Terminal

CLEVELAND, Ohio.—A 240,000-bbl. oil terminal is being constructed by Standard Oil Co. (Ohio) through a pipe line subsidiary at Mayersville, Mass.

The terminal will serve as the loading point for Tinsley crude which will be carried by a 43-mile 8-in. pipe line now being built to connect the Tinsley field in Mississippi with the Mississippi River.

This will permit the company to extend its water haul of crude oil by another 250 miles. The project will cost more than $500,000.

A portion of the pipe for the line is coming from a line now being dismantled in the Illinois field. The balance of the pipe will come from the Youngstown plant of Republic Steel Corp. Equipment and materials are being taken to the site by truck and barge because of the freight embargo.

Sohio has recently put into service

ANDERSON BROTHERS
Pipe Line
Contractors and Engineers
707 NORTH DRENNAN
HOUSTON, TEXAS

. . . . . with MODERN, EFFICIENT EQUIPMENT . . . AND PLENTY OF IT!

above all EXPERIENCE

Not just Contractors but PIPE LINE SPECIALISTS

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PIPE LINE CONSTRUCTION EQUIPMENT
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Cut & Bevel Any Pipe With Maximum SPEED Minimum COST

The H & M PIPE CUTTING and BEVELING MACHINE

SPEED: Complete cut and bevel can be made on 12 inch pipe in about 2 minutes.
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CONQUER
CORROSION
Get complete protection for all kinds of above and below ground piping and every type of pipe line structure with these proven conquerers of corrosion.
"BITUMASTIC" HOT APPLIED PIPE LINE COATING
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CATHODIC PROTECTION UNITS . . . HOLIDAY DETECTORS
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Charter 4-5263
TEXAS LOUISIANA
AGENT & DISTRIBUTOR FOR
Wailes Dove-Hermiston Corp.
Philip Carey Mfg. Co.
Angier Corp.

a fleet of barges of new design which will increase the amount of crude which can be moved by a single tow. The barges are longer but narrower.

FPC Sets Hearing May 27 On Two Major Proposals

WASHINGTON.—Two applications for major natural-gas pipe-line construction have been set for hearing here May 27 in consolidated proceedings before the Federal Power Commission.

One is Michigan-Wisconsin Pipe Line Co.'s application for permission to construct a $70,000,000 pipe-line system to transport gas from the Southwest to markets in Missouri, Iowa, Illinois, Wisconsin, Indiana, and Michigan.

The other is Panhandle Eastern Pipe Line Co.'s application to make additions costing $21,097,000 during 1947 to the system it operates in Texas, Oklahoma, Kansas, Missouri, Illinois, Indiana, Ohio, and Michigan.

First Aerial Crossing of Mississippi Proposed

VICKSBURG, Miss.—The first aerial pipe line crossing over the Mississippi River is planned by Tennessee Gas & Transmission Co. just south of the river bridge at Greenville, Miss.

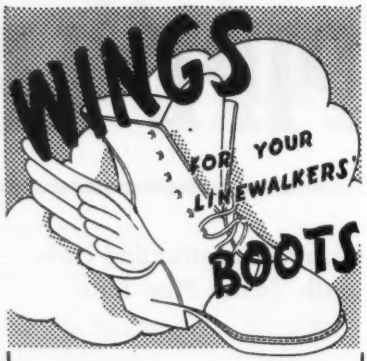
The plans were disclosed in an application submitted to the U. S. Army Engineer's office here. According to the plans, a structure to cost $1,500,000 would be erected, and when completed it would accommodate three 26-in. gas pipe lines. Such lines, heretofore, have been attached to existing bridges or have been laid under water.

Magnolia Laying Line

MIDLAND, Tex.—Magnolia Pipeline Co. has let contract to Latex Construction Co. for the laying of a 35-mile 10-in. line between its Andrews station and Midland terminal. Purpose of the line is to increase movement of sour crude from the Slaughter, Wasson, and Seminole fields.

Wyoming Line Connected

CASPER, Wyo.—A new pipe line joining Stanolind Pipe Line Co.'s 12-in. line from Elk Basin field to Casper has been connected to the Zimmerman Butte field in Hot Springs County, Wyoming, which was brought in recently by Pacific Western Oil Corp.



SAVE TIME—MONEY
Now—patrol pipelines profitably by plane. Southwestern Flight can give finest service to pipeline owners. Line breaks are detected quicker, repair crews dispatched sooner. Save time and money by using the service offered by Southwestern Flight.
PIPELINE INSPECTION CHARTER SERVICE
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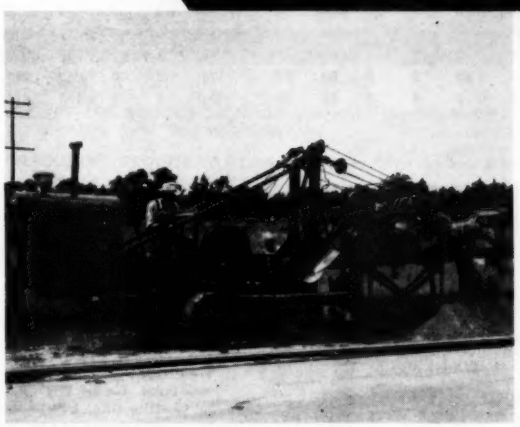
Partner

PIPE LINE CONSTRUCTION
COMPRESSORS WELDERS
DITCHERS TRUCKS
DOZERS TRACTORS
SMITH CONTRACTING COMPANY
ODESSA, TEXAS
MAIN BUSINESS OFFICE
FORT WORTH NATIONAL BANK BLDG.
FORT WORTH 2, TEXAS

Buckeye Trenchers KEEP ANY PIPE LINE JOB ROLLING SMOOTHLY



Whether it's across a lease or across a continent you can depend on your Buckeye Trencher to keep the job rolling smoothly—to dig sheer-walled, smooth bottomed trench that makes the pipe-laying job easier—and to do it faster than trench can be dug by any other means.

Besides doing the best trenching job faster, Buckeyes are noted for exceptional ruggedness that enables them to keep right on turning out trench year after year with the utmost speed and at lowest cost per foot. Buckeye Trenchers will dig through anything short of solid rock because of their in-built ruggedness plus outstanding excellence of design.

Top picture shows a Buckeye Model 48 "Mainliner" on the Tennessee Gas Line. It digs trench from 24" to 39" wide, 6½', 7½' or 8½' deep.

Left hand pictures show two Buckeye Model 12's, working on gathering lines in Mississippi and Texas. The Model 12 trenches from 15" to 24" wide and up to 5½' deep.

Check with your Buckeye dealer for full details.

BUCKEYE TRACTION DITCHER CO.
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CONVERTIBLE SHOVELS—BULLDOZERS—ROAD WIDENERS
TRENCHERS—MATERIAL SPREADERS—R-B FINEGRADERS

STATISTICS and

WEEKLY WELL COMPLETIONS . . . WEEK ENDED MAY 11, 1946

	Total of all wells					Cum. to date		Wildcat completions and discoveries					Cumulative total, 1946				
	Comp.	Oil	Gas	Dry	Footage	1946	1945	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	30	15	0	*15	42,310	562	441	0	0	0	0	0	0	0	0	0	0
Pennsylvania	82	40	10	†32	31,816	1,433	1,312	0	0	0	0	0	0	0	0	0	0
West Virginia	10	1	8	1	25,416	250	281	0	0	0	0	0	0	0	0	0	0
Ohio	27	6	9	12	71,474	400	277	0	0	0	2	2	2	0	9	15	26
Indiana	4	3	0	1	8,860	108	55	0	0	0	1	1	1	0	0	8	9
Kentucky	10	3	3	4	24,456	155	130	0	0	0	1	1	2	0	0	15	17
Illinois	42	24	0	18	100,838	749	555	1	0	0	10	11	16	0	0	131	147
Michigan	20	6	2	12	40,311	251	267	0	0	1	5	6	8	0	1	80	89
Kansas	49	23	5	‡21	161,966	704	543	0	0	0	9	9	9	0	3	88	100
Neb., Mo., Iowa	0	0	0	0	0	7	12	0	0	0	0	0	0	0	0	4	4
Oklahoma	42	24	2	§16	146,254	835	826	1	0	0	1	2	26	0	10	106	142
Texas	158	92	12	§54	668,308	2,844	2,563	4	1	0	28	33	71	14	9	430	524
North Central	60	28	0	32	154,835	988	728	0	0	0	14	14	20	0	0	172	192
West	30	25	0	5	164,378	598	684	3	0	0	3	6	20	0	0	64	84
Panhandle	8	1	5	2	24,498	135	207	0	0	0	0	0	0	0	0	4	4
Eastern	20	12	4	4	103,882	272	118	0	0	0	3	3	6	0	1	36	43
Gulf Coast	29	22	1	6	184,745	645	590	1	1	0	4	6	19	12	4	87	122
Southwest	11	4	2	5	35,970	206	236	0	0	0	4	4	6	2	4	67	79
Louisiana	43	31	3	9	251,413	466	336	1	0	0	1	2	24	5	3	58	90
Northern	23	18	2	3	84,027	240	108	0	0	0	1	1	4	0	0	30	34
Southern	20	13	1	6	167,386	226	228	1	0	0	0	1	20	5	3	28	56
Arkansas	1	1	0	0	3,177	66	59	0	0	0	0	0	2	0	0	8	10
Mississippi	2	2	0	0	10,348	83	120	0	0	0	0	0	1	0	1	22	24
Southeastern states	0	0	0	0	0	15	13	0	0	0	0	0	0	0	0	14	14
Montana	3	1	0	2	6,602	88	110	0	0	0	1	1	4	0	0	8	12
Wyoming	0	0	0	0	0	57	74	0	0	0	0	0	6	0	3	19	28
Colorado	2	1	0	1	9,765	42	12	0	0	0	1	1	2	0	0	6	8
New Mexico	10	8	1	1	36,150	137	183	0	0	0	1	1	2	0	0	15	17
California	44	33	4	7	178,830	661	851	0	0	0	4	4	4	0	2	79	85
Utah	0	0	0	0	0	2	2	0	0	0	0	0	1	0	0	1	2
Total United States	579	314	59	206	1,818,294	‖9,915	9,022	7	1	1	65	74	181	19	41	‖1,107	‖1,348
Total previous week	547	301	44	202	1,817,145	9,336	8,476	13	2	2	52	69	174	18	40	1,042	1,274
Total May 12, 1945	546	303	59	184	1,749,171	9,022	6,913	9	0	4	59	72	204	6	47	1,155	1,412

Service wells included: *15, †31, ‡2, §1, ‖revised.

MARKET QUOTATIONS

(Quotations on other products than those shown here furnished on request. Quotations are f.o.b. plant in tank cars and in cents per gal. as of last Monday.)

REFINERY GASOLINE

Octane (A.S.T.M.)	78-80†	73-75
Mid-Continent*	6.125-6.375	5.25-5.625
Texas Gulf Coast	6.375	5.625
New York Harbor	7.375	6.375
California		6.00-6.875

*Basic Oklahoma Group 3. †1939 C.F.R. (research method).

NATURAL GASOLINE

Grades:	25-70	18-55
Oklahoma (Group 3)	3.000	3.600
N. Texas (f.o.b. plant)	2.500	3.000
N. Louisiana (f.o.b. plant)	2.875	3.375
California	4.875	5.500

CRUDE-OIL PRICES

Representative posted schedules per bbl	
East Texas	$1.35
Conroe	1.53
Tepetate, Louisiana, avg. grav.	1.30
Illinois Basin	1.47
Pecos County, Texas	1.05
Bradford, Pennsylvania	3.10
Van, Van Zandt County, Texas	1.18

Note: Exclusive of subsidy.

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Texas	West Tex.*
18-18.9	$0.90	....	....	....
19-19.9	.94	....	$1.16	$0.80
20-20.9	.98	$0.95	1.18	.82
21-21.9	1.02	.97	1.20	.84
22-22.9	1.06	.99	1.22	.86
23-23.9	1.10	1.01	1.24	.88
24-24.9	1.13	1.03	1.26	.90
25-25.9	1.17	1.05	1.28	.92
26-26.9	1.21	1.07	1.30	.94
27-27.9	1.25	1.09	1.32	.96
28-28.9	1.28	1.11	1.34	.98
29-29.9	1.30	1.13	1.36	1.00
30-30.9	1.33	1.15	1.38	1.02
31-31.9	....	1.17	1.40	1.04
32-32.9	....	1.19	1.42	1.06
33-33.9	....	1.21	1.44	1.08
34-34.9	....	1.23	1.46	1.10
35-35.9	....	1.25	1.48	1.12
36-36.9	....	1.27	1.50	1.14
37-37.9	....	1.29	1.52	1.16
38-38.9	....	1.31	1.54	1.18
39-39.9	....	1.33	1.56	1.20
40 and above	....	1.35	1.58	1.22

*Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT

Week ended May 4, 1946
(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks: Gasoline	Distillate	Residual
East Coast	746	22,752	10,105	7,091
Appalachian	153	3,819	544	414
Ill., Ind., Ky.	777	21,764	4,054	3,203
Okla., Kan., Mo.	370	8,525	1,661	1,107
Inland Texas	214	2,972	326	742
Tex. Gulf Cst.	1,117	14,823	5,222	4,194
La. Gulf Cst.	316	4,127	1,866	1,267
N. La., Ark.	59	1,838	420	205
Rocky Mtn.	122	2,334	412	689
California	798	15,594	6,877	21,300
Total 5- 4-46	4,672	98,548	31,487	40,212
Total 4-27-46	4,685	99,631	30,466	39,404
Total 5- 5-45	4,821	89,451	29,391	39,661

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended:	Bbl. of crude*
May 4, 1946	221,911,000
April 27, 1946	224,443,000
May 5, 1945	221,019,000

*Excludes unrefinable Calif. stocks.

TRENDS

DAILY AVERAGE PRODUCTION FOR WEEK

	May 11 crude oil	Bureau of Mines May demand	May 4 crude oil
Alabama	1,050	700	1,050
Arkansas	78,100	79,000	77,950
California	867,750	840,000	860,500
Colorado	27,360	23,000	28,180
Eastern	66,900	62,900	66,000
Florida	250	200	250
Illinois	209,600	204,000	212,100
Indiana	18,450	16,400	19,250
Kansas	245,300	252,000	244,650
Kentucky	31,500	30,000	31,150
Louisiana	*378,500	380,000	*376,650
North Louisiana	87,050	.....	85,200
South Louisiana	*291,450	.....	*291,450
Michigan	47,600	46,000	46,040
Mississippi	60,750	53,000	57,050
Montana	23,660	22,000	23,910
Nebraska	800	800	750
New Mexico	*94,500	99,000	*94,500
Oklahoma	373,250	370,000	363,700
Texas	*2,114,800	2,050,000	*2,114,800
East Texas	388,800	.....	388,800
East Central Texas	*142,100	.....	*142,100
North Central Texas	165,000	.....	165,000
Texas Panhandle	83,000	.....	83,000
West Texas	521,200	.....	521,200
Southwest Texas	*327,900	.....	*327,900
Texas Gulf Coast	*486,800	.....	*486,800
Wyoming	103,820	97,000	102,570
Total United States	*4,743,940	4,626,000	*4,721,050
Change from previous week	up 22,890		

Total production January 1-May 11† ..... 624,538,050 bbl.
Same period last year .....

*Revised to exclude condensate. †To be revised later.

CRUDE-OIL STOCKS 221,911,000 bbl. as of May 4—down 2,532,000 bbl. One year ago 221,019,000 bbl.

GASOLINE STOCKS 98,548,000 bbl. as of May 4—down 1,083,000 bbl. One year ago 89,451,000 bbl.

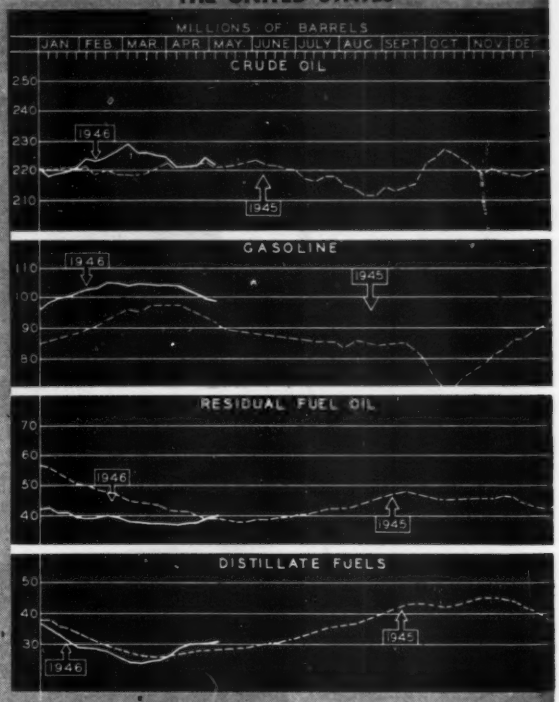
RESIDUAL FUEL-OIL STOCKS 40,212,000 bbl. as of May 4—up 808,000 bbl. One year ago 39,661,000 bbl.

GAS OIL AND DISTILLATE STOCKS 31,487,000 bbl. as of May 4—up 1,021,000 bbl. One year ago 29,391,000 bbl.

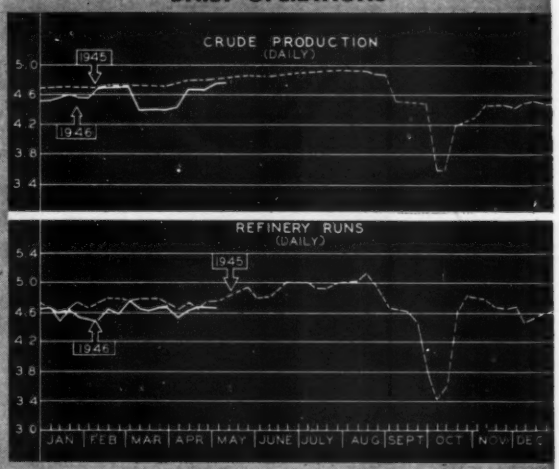
CRUDE-OIL PRODUCTION 4,743,940 bbl. as of May 11—up 22,890 bbl. One year ago 4,852,300 bbl.

REFINERY RUNS 4,672,000 bbl. daily week ended May 4—down 13,000 bbl. One year ago 4,521,000 bbl.

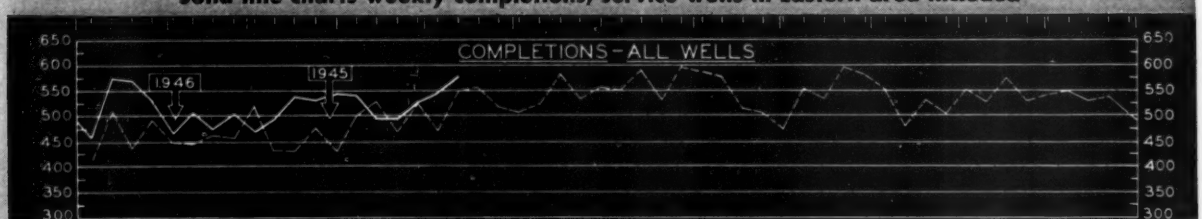
OIL STOCKS IN THE UNITED STATES

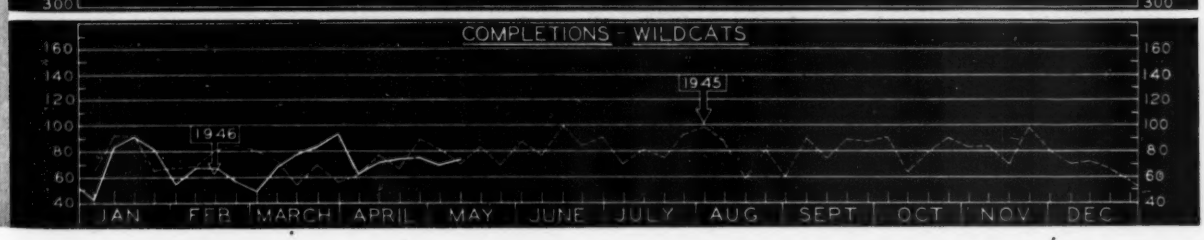


DAILY OPERATIONS



Solid line charts weekly completions, service wells in Eastern area included

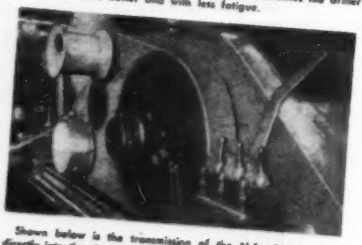




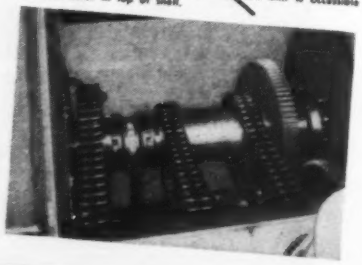
Reduced Reproduction of recent advertisement of The Brewster Co., Inc.

OK'd by DRILLERS

In addition to the regular friction clutch for high speeds and high pulls, the drum is equipped with a jaw clutch for slow speeds and heavy pulls. This feature gives positive action when it is most needed and enables the rig to handle the maximum horsepower of the engines. Also shown below are the three air control valves. Note that they are conveniently located and that regular manual controls are also provided. This enables the driller to do his work better and with less fatigue.



Shown below is the transmission of the N-6 which is built directly into the rig and is not a separate unit. Shafts are extra heavy and are mounted on self-aligning bearings to insure smooth operation and long life. Positive acting jaw clutches give trouble free operation. Sprockets have flame hardened teeth. Chains are S.A.E. standard. Eight speeds forward and two reverse are provided on the drum, while the rotary has four speeds forward and one reverse. The entire unit is accessible thru one door in top of shell.



BREWSTER N-6 DRILLING RIG

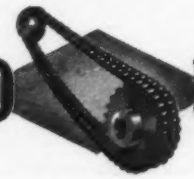
Drillers in the field—men who know and run machinery—have O.K.'d the Model N-6 Drilling Rig. There are many reasons for this approval. The N-6 can handle all loads with ease and speed to depths of 7,000 feet using 4½ inch pipe. Air controls are available to enable the driller to do his work better and more efficiently. Overall height has been held to 61 inches for better all around vision. All moving parts except catheads are completely enclosed providing maximum safety. The lubrication system is equipped with a filter so that clean oil is fed to sprockets and chains at all times. The 400 h.p. input is supplied by two engines for maximum flexibility. Loading and hauling is made easy by removing the engines to make two loads.

With these and many other features the N-6 will win your O.K. also. Write or wire now or see the Composite Catalog for further information on Brewster equipment.

THE BREWSTER CO. INC.
For Over 30 Years Makers of Fine Oil Field Equipment
SHREVEPORT LOUI
EXPORT OFFICE

And the Drives are OK too!

Into the Brewster N-6 Drilling Rig went over 30 years' experience in the making of fine oil-field equipment. It was only natural then, that this extensive background of skill and engineering dictates the use of DIAMOND Roller Chain Drives for maximum transmission efficiency and reliable, long-life service. DIAMOND COMPANY, Inc., Dept. 475, 402 Kentucky Avenue, Indianapolis 7, Indiana. *Tulsa Office:* 2238 Terwilleger Blvd.



DIAMOND ROLLER CHAINS

Exploration and Drilling

Michigan Test Interesting

MICHIGAN operators are watching with considerable interest the performance of Rex Oil & Gas Co. 1 Skalitsky-Weller, NW NW SE 8-14n-7w, in Mecosta County. This well had the top of the Dundee at 3,701 ft., and drilled in 1 ft. to 3,701 ft., total depth. Oil started flowing as soon as the tools were removed, and flowed 46 bbl. in the first 50 minutes. Later, on a second test, it flowed 42 bbl. in 10 minutes. Then, while running 2½-in. tubing, the well flowed a total of 274 bbl. in 3½ hours. The company has announced that the well will be produced at the rate of 200 bbl. per day.

The new discovery is about 1 mile southeast of the now abandoned one-well Whatlant pool, which found oil in the Dundee at 3,690 ft., in May 1945, and produced 75 bbl. of oil and an equal amount of water on the first test, but produced only 255 bbl. of oil total, prior to abandonment.

One of the interesting features of the new discovery is that it is practically surrounded by gas fields, which produce from the Stray-Marshall gas sand, near the top of the Mississippian. Followers of trend theories find many puzzling developments and seemingly conflicting evidence in the development of this gas area, and also the results of the oil discoveries.

The gas discoveries and development started back in 1930 and have continued at intervals. After the discovery of Reed City, Michigan's largest oil field, in 1941, at the northwest corner of the trend, wildcatting picked up and several oil fields have been found, along with some additional gas fields. Such oil fields as Cedar, Evart, Fork, Coldwater, Sherman, Belly Achers, to the east, and Goodwell on the west, have mostly produced oil from the Dundee in the Devonian, although trend students may find some significance in the fact that Goodwell on the west produces from the Traverse lime, which lies above the Dundee.

The new discovery found the Dundee oil right in the top of the lime formation, and this is pretty much characteristic of the area. Porosity in the lime must accompany structure to permit oil accumulation. The problems of the whys and wherefores of porosity and oil accumulation in lime in Michigan are generally the same as in many other areas. This is a subject which many geologists are hoping will be resolved into a project by the research committee of the American Association of Petroleum Geologists.

SOUTH LOUISIANA

New Deep Pay Opened By Sun Oil and Sohio

NEW ORLEANS.—A new deep pay is being opened by Sun Oil Co. and Sohio Petroleum Co. at 3 Elizabeth Regan, 31-9s-1w, in the Egan field of Acadia Parish. Total depth is 13,500 ft. and 5½-in. casing is cemented to 11,986 ft. Production is through 96 perforations at 11,874-11,906 ft. and after installing the christmas tree, the well was put on a ⅛-in. choke and cleaned, making mostly gas and a little condensate. Initial gage on the tubing was 7,200 lb., but it built up to 8,000 lb. and was shut in.

The California Co. is testing a new deep sand in its confirmation test at Bayou de la Fleur, Jefferson and Plaquemines parishes. The 2 E. P. Brady et al, 34-16s-24e, northeast of the discovery well, is making an initial production try after making a lower squeeze job through perforations from 10,483-85 ft. Total depth is 11,500 ft. and 5½-in casing is cemented at 10,491 ft. The lower sands were picked up in the discovery from 10,275-90 ft. and from 10,415-42 ft., but was completed through perforations at 9,366-85 ft. for a gage of 300 bbl. of 38-gravity oil daily through a 9/64-in. choke.

At Venice field, Plaquemines Parish, the Tide Water Associated Oil Co. 29 Buras Levee District, 21-21s-30e, opened a new and deeper pay when the well flowed 326 bbl. of 38-gravity oil daily through a 7/64-in. choke, through perforations at 13,000-17 ft. Flowing pressure on the tubing was 4,300 lb. Total depth is 13,020 ft. and 5½-in. casing cemented on bottom.

The second producer for the Mamou area in Evangeline Parish has been completed at Magnolia Petroleum Co. 1 O. L. Guillery, a northwest offset to the discovery well, 1 Morein, in 6-5s-1e. Completed in the discovery pay through perforations at 11,577-87 ft., the well flowed an initial gage of 270 bbl. of oil daily through a ⅛-in. choke with gas-oil ratio of 1,800 to 1. Total depth is 11,641 ft. Magnolia 1 L. F. Dues, 6-5s-1e, ¾ mile southwest of the discovery, picked up the discovery pay and showed oil saturation from 11,775-90 ft. and 11,875-11,910 ft. Oil tested from these sands showed it to be 35 gravity. Well is being drilled ahead below 11,910 ft.

Union Producing Co. et al 1 Belgard, wildcat test in the Big Island area of Rapides Parish, in center NE NW 14-4n-3e, made a 30-minute drill-stem test of open hole in the Paluxy from 10,020-31 ft., using ¼-in. top and bottom chokes to recover 52 stands of salt water, 12 stands of drilling mud with no showings of oil or gas with a maximum pressure of 14 lb. Total depth of the hole is 12,001 ft. Operators are plugging back. This wildcat is regarded as a good prospect to open a new Tuscaloosa Massive sand reservoir from pay at 9,770-9,802 ft. where saturated sand was recovered in sidewall cores.

Only two wildcat locations were reported this week, one each in East Baton Rouge and Terrebonne parishes. The remaining 15 locations are in proven areas with Evangeline Parish receiving six in the recently opened Mamou area. A new oil pay was opened at Venice pool in Plaquemines Parish, 12 oil wells were completed, 1 gas, and 6 dry holes. Calcasieu Parish led with six completions, five being producers.

SOUTH LOUISIANA SUCCESSFUL WILDCATS

Plaquemines Parish: New oil pay Venice field—Tide Wate Associated Oil Co. 29 Buras Levee District, 21-21s-30e, TD 13,020 ft., top sand 13,000 ft. Perf. 66 holes 13,000-17 ft., PT: 326 bbl. 24 hours through 7/64-in. choke, gas-oil ratio 1,900 to 1, TP 4,300 lb., gravity 38°, 0.1 per cent water.

CALIFORNIA

Richfield's 1 Keller Test Marks Field Extension

LOS ANGELES.—Richfield has picked up pay in 1 Keller in Section 9-2s-12w and when this well is completed the company will have extended the productive limits of the East Los Angeles-Bandini field about ½ mile north of present production.

Outer limits have been established only to the east but failure of Chanslor Canfield Midway Oil Co. to find the productive zone in 1 Bandini about 1 mile to the south limits expansion in this direction.

Shell is making progress with 1 Pansini located southeast of Richfield's discovery well and is down to 8,882 ft. Union Oil Co. will probably start its first test on the Goodrich lease in the near future. The Goodrich lease is located northwest of Richfield's discovery well.

Richfield is developing this field in a conservative manner. Production has been reduced to 500 bbl. per day. The company has not yet decided on how large a casinghead plant will be required. In the meantime, wet gas is being delivered into the pipe line of the utility serving this area.

Standard extended the limits of the Kirby Hills gas field of Solano County this week by completing 1 Kirby Comm. in Section 24-4n-1w flowing 4,177,000 cu. ft. daily through a 32/64-in. bean. A formation test made a week or so ago indicated that Standard could expect a commercial gas well. Top of the Nortonville was cored at 930 ft., and top of the Domengine was

logged at 1,530 ft. Top of the productive gas sand was found at 1,810 ft. and bottom of the hole is at 2,350 ft. A formation test at 1,530-1,681 ft. suggested the possible existence of an upper gas zone above the present productive interval.

Natural Gas Corp., a subsidiary of Pacific Public Service Co., extended the Dunnigan Hills gas field north of Sacramento several days ago by completing 1 DuBois in Section 28-11n-1w, flowing 1,227,000 cu. ft. daily through a ¼-in. choke. Top of the Capay shale was found in this outpost at 2,022 ft., top of the Capay grit zone at 2,532 ft. and top of the Cretaceous at 2,568 ft. The well was carried into the Cretaceous for a depth of 312 ft. and then plugged back to 2,600 ft. and perforations landed at 2,520-99 ft.

Standard of California and the Navy Department are completing 44-24-Z in the extreme west end of the Hillcrest section of the Elk Hills field. This outpost is located only a few hundred feet east of the west boundary of the reserve. With several hundred feet of saturated Stevens oil sand from which to produce, this well should show a substantial flow if permitted to flow through a 32/64-in. bean.

Development of the 237 zone in the Wilmington field is getting under way, and completion of the large wells is reflected in a higher daily production. Most wells are being produced at a daily rate of 1,800 bbl. each because one operator has refused to cut production back.

Completions and new locations just about balanced out this week indicating no change in the rate of drilling. There has been a reduction in recent weeks, however, but the change has been gradual and an upswing is possible as a result of increased deeper drilling at Wilmington.

CALIFORNIA WILDCAT FAILURES

Kern County, Cymric: Superior 64-20 L. & B., 20-29s-21e, bottomed in shale, form. test 2,956-74 ft. recovered mud and salt water, Phacoides was wet, TD 3,841 ft.

Dyer Creek: Gene Reid Drilling Co. 63-X Deepwell, 4-26s-27e, bottomed in gray sand, Vedder sand of Miocene age at 2,912 ft., was wet, TD 2,930 ft.

Oildale: Terry Oil Co. 1 K.C.L., 18-29s-28e, bottomed in hard gray sand, only minor showings, TD 2,507 ft.

Santiago: General Petroleum 1 B.M.Q., 20-11n-23w, bottomed in brown shale, Santiago zone was missing, TD 4,768 ft.

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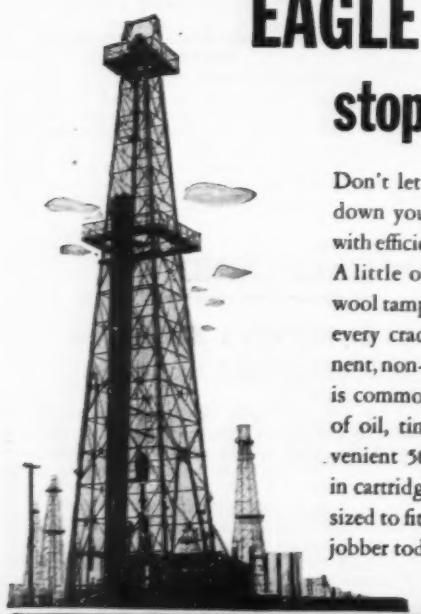

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SOUTHWEST TEXAS

New Gas-Condensate Pool Opened in Willacy County

CORPUS CHRISTI.—A new gas-condensate pool has been opened in Willacy County about 2 miles northwest of the La Vieja field deep production by Magnolia Petroleum and J. S. Abercrombie Co. 1 O. E. Todd. Drilled to a total depth of 11,651 ft., flowed 50 bbl. of 55-gravity condensate, gas-condensate ratio 100,000 to 1, through 20/64-in. choke, with 2,675 lb. tubing pressure, through perforations at 7,540-60 ft. The well is now shut in. Seven-in. casing was set to 10,548 ft. This well is located in Section 1, Lot 7, Block 1, Narcisco Subdivision 4, of San Juan de Carricitos Grant, and 5 miles west of Raymondville.

In Brooks County, 4 miles southeast of Alta Mesa field, Tom Graham 1 Prosper Mangell, new oil pool opener, is being put on the pump for completion through perforations at 6,558-63 ft. On initial test flowed small amount of 21-gravity oil and salt water. Total depth is 7,310 ft. with casing set at 6,625 ft. It is located in La Encantada Grant.

Sun Oil Co. 4-B Mary M. Lasater, shallow oil pool opener, on Gyp Hill dome, flowed 41 bbl. of pipe line oil per day from open hole at 4,070-75 ft. with gas-oil ratio of 343 to 1, through ¼-in. choke, tubing pressure 30 lb., casing sealed, no water, 43-gravity oil. Total depth is 4,075 ft. with 7-in. casing at 4,070 ft. and 2-in. tubing at 4,066 ft. Only other production in this area was The Texas Co. 3 Lasater, northeast of the Gyp Hill dome, which flowed gas-condensate from 6,656-60 ft.

Ralph E. Fair et al 1 Reynolds & Richardson, wildcat 6,500 ft. northwest of Magnolia City field, in Jim Wells County, recovered 225 ft. of 41-gravity oil on drill-stem test at 5,403-10 ft. in the Frio zone. On drill-stem test in Stillwell sand in the Vicksburg zone, topped at 5,817 ft., recovered 10 per cent oil and 90 per cent salt water. Total depth is 5,883 ft. Operators set casing at 5,456 ft. to perforate for completion in the 5,400-ft. Frio zone. Fair has made location for 1 Wm. F. Filter, 2,350 ft. northeast of 1 Reynolds & Richardson, in the W. N. Staples Survey, Abstract 436.

Southern Minerals Corp. 2 Katherine Clifton, wildcat 1 mile south of Tynan, in San Patricio County, reports sand with oil show, and operators are preparing to set 5½-in. casing for completion attempt. Total depth is 5,305 ft., exact depth of the showing not reported.

A new gas-condensate pool has been opened by Shell Oil 1 Wm. van Hoogenhuyze, in Jim Wells County, 2 miles east of Wilson field, and 4½ miles southeast of LaGloria, near the Kleberg County line. Drilled to a total depth of 10,086 ft., well gaged 108 bbl. of condensate and 7,750,000 cu. ft. of gas per day through a ⅜-in. choke, making 48-gravity straw-colored condensate with 3,200 lb. tubing pressure,

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through perforations at 9,023-38 ft. and 9,060-69 ft.

New pay discovery at Gaffney field, Victoria County, is Ralph E. Fair and Wiegand Bros. 1 Mrs. Etta Terrell, which gaged 60 bbl. of net oil per day plus 60 per cent salt water through a 9/64-in. choke, tubing pressure 1,090 lb., casing sealed. Gravity of the oil is 28°, and gas-oil ratio is 950 to 1. Production is from new pay zone in the Vicksburg through perforations at 5,461-65 ft. Top of sand is at 5,461 ft. Total depth is 5,606 ft., with 5½-in. casing at 5,550 ft., and 2-in. tubing at 5,430 ft. New location was made for 2 Mrs. Etta Terrell, 1,320 ft. southwest of this new pay discovery. It is to be drilled to 5,700 ft.

Bridwell Oil Co. 1 J. W. Baird, prospective gas well in Bee County, 1 mile west of the Sliva field discovery oil well, set 5½-in. casing to 4,407 ft. Total depth is 4,411 ft. On a 5-minute drill-stem test in the Frio zone at 3,436-44 ft. the well developed 260 lb. working pressure. Gas sand was logged at 4,398-4,406 ft. in Vicksburg zone. On drill-stem test at 4,405-11 ft. 700 ft. of salt water and 20 ft. of sand were recovered in 15 minutes, with 22 lb. working pressure and 1,920 lb. bottom-hole pressure flowing. Electrical log was run and the 5½-in. casing was set. The 1 Jake Huble Estate located 2,200 ft. southeast of the 1 Baird has been spudded by Bridwell. It is located in the Brooks and Burleson Survey, Abstract 497.

Humble Oil & Refining Co. 1 Alamo Lumber Co., located 4,100 ft. southwest of the 1 Schorsh gas discovery at Jourdanton, in Atascosa County, is reported will be the largest gas well in this area and is running a little higher than the 1 Schorsh well. It has cored to a depth of 7,380 ft. in Edwards lime.

Forty new locations were reported this week of which 10 are wildcats, 2 each in Refugio and Victoria counties and 1 each in Caldwell, Jim Wells, Karnes, San Patricio, Starr, and Webb counties. Two new pools were opened this week, one each in Brooks and Jim Wells counties. There were eight wildcats, one each in Guadalupe, DeWitt, Duval, Karnes, McMullen, Nueces, Victoria, and Webb counties. Refugio County received the greatest number of new locations, reporting seven new starts while Nueces and Starr counties were next with four each.

SOUTHWEST TEXAS SUCCESSFUL WILDCATS

Brooks County: Oil discovery Gyp Hill field —Sun 4-B Mary M. Lasater, GB&CNG Sur. 331, 6½ mi. SE of Falfurrias, TD 4,075 ft., no perf., PT 41 bbl. oil per day through a ¼-in. choke, gas-oil ratio 343 to 1, casing sealed, gravity 43°, no water.

Jim Wells County: New gas-condensate pool —Shell Oil 1 William Van Hoogenhuyze, De La Garza Grant, 4½ mi. SE of La-Gloria and 2 mi. E of Wilson field, top pay 9,023 ft., TD 10,086 ft., perf. 90 holes 9,023-38 ft. and 48 holes 9,060-69 ft., PT 7,750,000 cu. ft. gas per day and 108 bbl. condensate per day through 3/8-in. choke, TP 3,200 lb., casing sealed, gravity 48° (straw colored), no water.

SOUTHWEST TEXAS WILDCAT FAILURES

Guadalupe County: United North & South Dev. Co. 2 Mrs. Cora Mackey, James Hodges Survey 66, top Edwards lime 2,920 ft., dry, TD 2,932 ft.

DeWitt County: Sterling O & R Corp. 1 Ernest Steinmann, P. Tumlinson Sur., 4 mi. SE of Yoakum, dry, TD 9,017 ft.

Duval County: Humble 1-C Dallas Jt. Stock Land Bank, C. K. Gravis Sur., dry, TD 3,393 ft.

Karnes County: H. R. Smith and Skinner & Eddy Corp. 1 Mrs. Adeline Weddington, Geo. Elliott Sur. 138, 6 mi. SW of Hysaw field, dry, TD 4,170 ft.

McMullen County: O. D. Edwards 1 Annie Dolph et al, C. Sandoval Sur., 12 mi. SE of Tilden, dry, TD 1,515 ft.

Nueces County: Smith & McBride 1 Clara Driscoll, Jose A. Cabasos Sur. 63, ¾ mi. NE of Brayton field, dry, TD 8,305 ft.

Victoria County: J. B. Ferguson and F. W. Michaux 1 E. B. Fuhrman, V. Garcia Grant, 3 mi. SW of Inez, dry, TD 5,126 ft.

Webb County: Cox & Hamon 2 Clyde C. Marshall, SM&S Sur. 334, 5 mi. NE of Oilton, dry, TD 2,120 ft.

APPALACHIAN FIELD

West Virginia Test Extends Development

PITTSBURGH.—In Elk district, Kanawha County, West Virginia, Glenn Dearth completed an Oriskany test on Numa Block Coal Co. which had an open flow of 13,500,000 cu. ft. of natural gas, which extends the new development. From a surface elevation of 782 ft. the Corniferous lime was topped at 4,870 ft., Oriskany 4,986 ft., gas 4,987-5,013 ft., rock pressure 1,820 lb. 12 hours; total depth 5,015 ft.

In Baileysville district, Wyoming County, Godfrey L. Cabot, Inc., completed 1,197 Ford Motor Co. good for 1,078,000 cu. ft. of gas with the Maxton sand 1,950 ft., gas gaging 119,000 cu. ft. at 2,003 ft., Big lime 2,537-64 ft., 94,000 cu. ft. of gas at 2,610-15 ft., Injun sand 2,964-3,039 ft., 127,000 cu. ft. of gas at 3,036-39 ft., Weir sand 3,123-41 ft., Berea 3,663-88 ft., gas 3,671-87 ft., shot 3,668-88 ft., total depth 3,689 ft.

In Clear Fork district, Raleigh County,

United Fuel Gas Co. completed 5,726 Coal River Mining & Lumber Co. good for 959,000 cu. ft. of gas from the Weir sand, total depth 2,501 ft.

In Ripley district, Jackson County, United Carbon Co. drilled through the Oriskany sand in the test, 1,339 L. M. Parsons with no gas showing. The surface elevation is 782 ft.; Corniferous lime 4,826 ft., Oriskany 4,924-60 ft., black lime to 4,962 ft., where it is drilling.

The test of Paul Schwer on the Alcoma Country Club, Penn Township, Allegheny County, Pennsylvania, has produced about 75 bbl. a day by swabbing and is now being put to pumping with 40 bbl. the first day. The test is only 20 ft. in the Hundred Foot sand and with the bottom pay undrilled. Additional locations for two more tests have been made.

In North Strabane Township, Washington County, the Charles E. Young 2 Senkinc has stopped flowing but as there is only 1,000 ft. of casing in the hole with a total depth of 2,552 ft. it is believed bridged. Casing will be run this week when the agitation is expected to produce more oil.

CANADIAN FIELDS

Southern Alberta Well Flows 250 Bbl. an Hour

CHATHAM, Ont.—In the West Taber field, southern Alberta, Taber-Province 65-15-A, LSD 11, 15-9-17w4, finished in the Taber sand at 3,193 ft., is a flowing well with initial production 250 bbl. an hour of 23.7-gravity oil, with gas-oil ratio of 250 cu. ft. per barrel. Previous wells in the field have produced from 20 to 60 bbl.

Turner Valley.—In South Turner Valley, work is being resumed at Westflank 2, LSD 8, 32-18-2w5. Originally finished in 1937 at 6,888 ft. with 312-bbl. production, the well was chosen some months ago as scene for an experimental shot of 5,200 qt. of nitroglycerin. Mechanical troubles developed in cleaning out the hole after the shot, and operations were temporarily suspended. It will now be cleaned out to bottom and results of the shot tested.

Ram River.—In the Central Alberta foothills, Ram River Oils 4, LSD 9, 36-34-10w5, on the Ram River-Clearwater structure encountered an oil show at 1,016 ft. It is believed to correspond with porosity indicated in the nearby Altoba well at 1,196-1,300 ft. The formation is being cored for production test.

Steveville.—In the Steveville field, eastern Alberta, National-Empire 1, LSD 10, 34-19-12w4, finished last October at 3,288 ft. with a large gas production, is testing for oil. Initial tests, blowing at 8,000,000 cu. ft. a day, showed around 25 bbl. recovery. Farther north, California-Standard has spotted Princess-C.P.R. 12-22-A in LSD 1, 22-20-12w4, just a mile south of Princess-C.P.R. 16-22-A gasser and will test for oil production below the gas horizon.

Jumping Pound.—In the Jumping Pound area in the foothills west of Calgary, the important Shell Exploration 16-14-J test faulted from Blairmore to lower Benton at 8,120 ft. but returned to upper Blairmore at 8,320 ft. and is deepening. This test, in LSD 16, 14-25-5w5, is south and west of Shell 4-24-J which got 13,000,000-cu. ft. wet-gas flow with initial recovery of 93 bbl. in Madison limestone at 9,947 ft.

Crossfield.—In the Dog Pound-Crossfield area, northeast of Turner Valley, Imperial-Anglo Canadian 1, LSD 9, 11-28-2w5, finished at 9,526 ft. after getting water in both the Madison and Devonian formations, is perforating to test the Dalhousie sand at 8,170 ft.

Pinhorn Dome.—On the Pinhorn Dome, in southern Alberta close to the Montana

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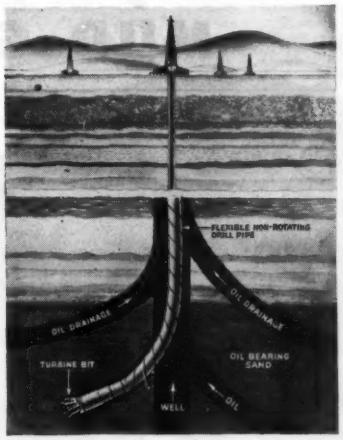

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boundary, McColl Frontenac-Union Oil has located a second joint test in LSD 16, 29-1-9w4, 5 miles west and 1½ miles south of their abandoned first test.

Kinsella.—In the Kinsella field, east of Edmonton, Northwestern Utilities 20, LSD 6, 35-48-12w4, finished in the Viking sand at 2,203 ft. and is testing production, with a good gasser indicated. Northwestern 19, LSD 6, 32-48-11w4, is drilling. In the eastern end of the field, Imperial 12, LSD 7, 28-48-8w4, has been abandoned at 1,985 ft. Imperial 8, LSD 11, 22-49-11w4, which was deepened to the Devonian limestone at 4,182 ft., has been abandoned. The latter two wells were part of a systematic propram by Imperial to delimit this section of the Kinsella gas field.

De Winton.—No definite results have yet been obtained at the Royalite-De Winton 1, LSD 14, 16-21-1w5, in the DeWinton area east of North Turner Valley and 15 miles south of Calgary. The 7-in. casing was set on top of the brown sand of the Dalhousie formation at 8,198 ft. where substantial oil shows were encountered, and initial drill-stem test gave 280 ft. of fluid with 20 ft. of light oil. Drilling will likely be continued into the Madison limestone. after which the Dalhousie will be tested.

EASTERN TEXAS

Humble Test Opens New Smith County Oil Pool

DALLAS.—Humble Oil & Refining Co. 1 Poole, William Sanders Survey, opened a new oil pool 4 miles southwest of Mount Sylvan in northwestern Smith County, when it flowed 522 bbl. of 34.6-gravity oil in 24 hours on official test. Flow was through ¼-in. tubing choke. Production is through perforations from 7,339-52 ft. in the Paluxy sand. Total depth is 7,665 ft.

Barnsdall Oil Co. and Sohio Petroleum Co. 1 Pickering, R. E. Sevey Survey, Smackover discovery 4 miles southwest of Texarkana, Bowie County, was preparing to acidize before taking official test. The well was plugged back from 7,501 ft. in the Eagle Mills, lower Smackover section, to 7,095 ft. On the last gage it made 85 bbl. of distillate in 24 hours through 20/64-in. tubing choke. Gas-oil ratio was 52,000 to 1.

Clark & Cowden Drilling Corp. 1 Southern Pine Lumber Co. is a new wildcat for Cherokee County, 6 miles southwest of Rusk. It is 1,134 ft. from the west line and 2,645 ft. from the south line of the Nicholas Newton Survey. W. B. Hinton 1 Betts, Beard Survey, wildcat 3 miles southeast of Marietta in Cass County, drilled the Woodbine sand from 3,748-78 ft. with cuttings showing sand and sandy shale stained with dead oil. It was drilling below 4,393 ft.

Carthage field, Panola County, had four completions this week, and Sand Flat field, Smith County, and Hawkins field, Wood County, had two each. Carthage field had four locations and East Lake field, Anderson County, and Smithfield field, Marion County, three each. Carthage field has 30 drilling wells, Hawkins field 21, New Hope field, Franklin County, 6, and Sand Flat field 4.

EASTERN TEXAS WILDCAT FAILURES

Freestone County: J. B. Daniels 1 F. R. Hill, J. M. Acosta Sur., 7 mi. NE Fairfield, elev. 325 ft., Austin 3,832 ft., Woodbine 4,517 ft., dry, TD 4,665 ft.

Limestone County: C. W. Killough et al 1 Belle Arnet, P. Varela Sur., 5 mi. NW Grossbeck, dry, TD 5,083 ft.

Navarro County: Woodbine Oil Corp. 1 W. W. Carter, E. R. Van Horn Sur., ¾ mi. N Powell, elev. 371 ft., dry, TD 1,500 ft.

PERMIAN BASIN

Superior Oil Co. Well Completed for 691 Bbl.

MIDLAND, Tex.—Superior Oil Co. 1 Eva Coopwood, Section 4, Block A-47, Public School Land Survey, 1 mile south of the most southern production in the Fullerton 8,500-ft. pool, has been completed for 691 bbl. of 42-gravity oil in 24 hours through ½-in. choke. Gas-oil ratio was 1,275 to 1. Casing pressure was 1,225 lb. and tubing pressure 970 lb. Production is from 6,848-7,002 ft., total depth.

Union Oil Co. 2 E. P. Cowden, Section 7, Block A-55, Public School Land Survey, promises to be the largest producer in the Dollar Hide pool of southwestern Andrews County. On a 2-hour drill-stem test in the Devonian from 7,700-7,804 ft., gas came to the surface in 30 minutes, drilling mud in 90 minutes and oil in 100 minutes. The well flowed for 20 minutes at an estimated rate of 60 bbl. per hour, with 1,500,000 cu. ft. of gas. Five and one-half inch casing will be run for completion.

Stanolind Oil & Gas Co. 1 Lee Irish, Section 18, Block ET, HE&WT Survey, first oil producer in Hale County and 3 miles east of the Anton pool in southeastern Lamb County, has been completed to pump 354 bbl. of 30.6-gravity oil in 24 hours. Pay section is from 5,511-5,881 ft. Gas-oil ratio was 148 to 1. Humble Oil & Refining Co. 1 Pio Crespi, Section 19, Block 38, T-2-S, T&P Survey, 1 mile northwest outpost to the Midland pool in Midland County, 9 miles southeast of Midland, made a test of the Devonian with packer at 11,428 ft. and recovered water blanket and 150 ft. of 49.2-gravity distillate. Gas came to the surface in 2 hours and 20 minutes, estimated at 50,000 cu. ft. A test was attempted from 11,432-88 ft., but the packer failed. After deepening 3 ft. to 11,491 ft., operator was preparing to run another drill-stem test. The test missed the Strawn pay found in the discovery at 10,370-90 ft.

The Texas Co. 1-F Fraser, Section 39, Block 45, T-1-N, T&P Survey, Ector County, wildcat 2 miles north of the TXL pool, which produces from the Devonian and Ellenburger, ran a 2½-hour drill-stem test from 8,580-8,625 ft. Gas came to the surface in 1 hour. Recovery was 1,075 ft. of oil and 5,500 ft. of salt water. The test was in the Fusselman zone. It was drilling ahead below 8,634 ft. in lime and chert.

John W. Murchison 1 Fraser, Section 7, Block 45, T-2-S, T&P Survey, wildcat 4 miles south of the TXL pool, topped the Devonian at 8,510 ft. with elevation of 3,870 ft. Formation was softening while drilling below 8,555 ft.

Garza field, Garza County, had four completions this week, Fullerton field, Andrews County, TXL-Ellenburger field, Ector County, and Keystone-Ellenburger field, Winkler County, each had two. Fullerton field had four locations and Slaughter field, Cochran County, had seven. TXL field has 39 drilling wells, Keystone-Ellenburger field 29, Fullerton field 27, Block 31 field, Crane County, 21; Welch field, Dawson County, 11; and Todd Deep field, Crockett County, 8.

WEST TEXAS SUCCESSFUL WILDCATS

Andrews County: Extension to old oil pool—Atlantic 1-A-11 University, Sec. 1, Blk. 11, University Lands, 1¾ mi. SE Martin-Ellenburger pool, elev. 3,288 ft., flowed 528 bbl. day through 3/16-in. choke on 2-in. tubing, perf. 8,680-8,740 ft. and 8,810-60 ft. Ellenburger, gravity 43.4°, gas-oil ratio 187 to 1, TD 9,060 ft. Extension to old oil pool—Phillips 1-M University, Sec. 31, Blk. 13, University Lands, 2 mi. S Fullerton pool, elev. 3,279 ft., flowed 1,104 bbl. day through ½-in. choke on 2-in. tubing, perf. 8,550-8,700 ft. Devonian, gravity 45°, gas-oil ratio 1,198 to 1, TD 8,791 ft.

Kent County: New oil pool—Humble 1 Lida Vick, Sec. 45, Blk. 5, H&GN Sur., 20 mi. N Snyder, elev. 2,332 ft., flowed 207 bbl. day through ¼-in. choke on 2-in. tubing, perf. 7,775-7,810 ft. Ellenburger, gravity 38.6°, gas-oil ratio 290 to 1, TD 7,938 ft.

WEST TEXAS WILDCAT FAILURES

Fisher County: Great Western and Honolulu 1 Kiser, Sec. 325, Blk. 2, G. W. Crowes Sur., elev. 1,818 ft., Saddle Creek 3,080 ft, dry, TD 3,300 ft.

Garza County: Mel Richards 1 Ralph Welch, Sec. 2, Blk. 4, K. Aycock Sur., elev. 2,367 ft., Clear Fork 3,078 ft., dry, TD 4,001 ft.

Terry County: Fred W. Shields 1 T. M. Covert, Sec. 30, Blk. O, HO&B Sur., 4 mi. N of SE corner of county, elev. 3,103 ft., San Andres 4,300 ft., dry, TD 5,184 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Continental Oil Co. 4-B-23 Skaggs, 23-20s-37e, discovering a new and deeper pay a short distance southeast of the Cass field in Lea County, flowed naturally 104 bbl. of oil in 24 hours, with about 150,000 cu. ft. of gas daily, on a test of the lower Permian lime from 6,660-6,720 ft. It was preparing for completion. The outpost missed the Cass pay, drilled to 7,900 ft. and plugged back. The area is about midway between Hobbs and Eunice.

C. W. Chancellor Oil Co. will drill a 4,900-ft. wildcat 2 miles east of the nearest production on the east side of the Maljamar field and 3 miles west of the Vacuum pool in Lea County. It is located in the center of the northwest quarter of the southeast quarter of 27-17s-33e. Amerada Petroleum Corp. 1 Hooper is a new 5,500-ft. wildcat 6 miles west of the Eunice-Monument pool in central Lea. It is in the center of the

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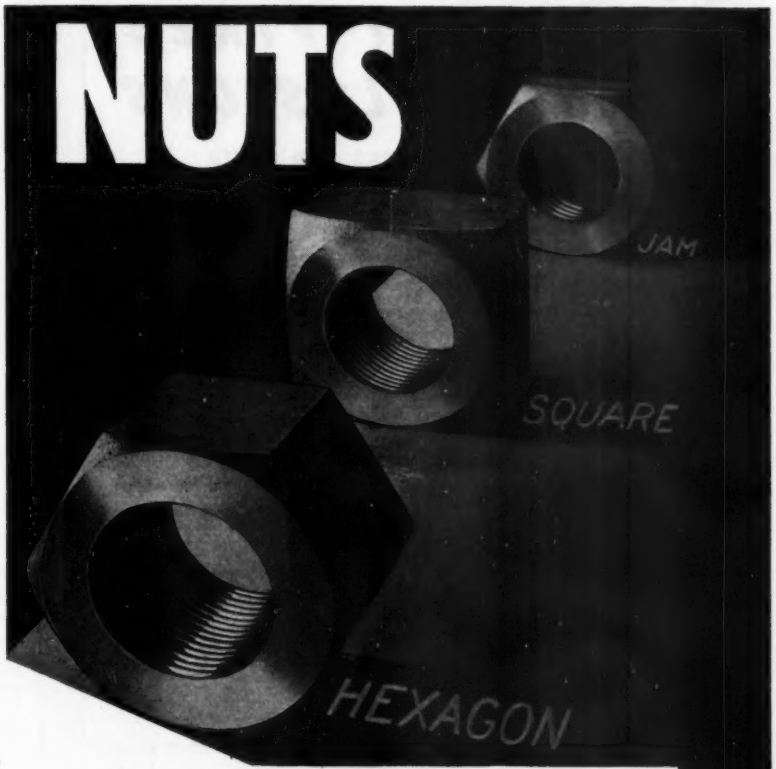

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northwest quarter of the northeast quarter of 27-19s-35e. Neville G. Penrose, Inc., 1 McCallister, 7-22s-38e, 1½ miles west of Ellenburger production in the Brunson field, central east Lea, was preparing to test the Clearfork from 7,665-7,776 ft.

Grayburg - Jackson field, Eddy County, and Caprock field, Chaves and Lea counties, each had three completions. Drinkard field, Lea County, had three locations and Paddock field, Lea County, and Fren field, Eddy County, each had one. Caprock field has 26 drilling wells; Drinkard field, 13; Square Lake field, Eddy County, 12; Grayburg-Jackson field, 10; Paddock field, 6. and Empire field, Eddy County, and West Roberts field, Lea County, 4 each.

SOUTHEASTERN NEW MEXICO WILDCAT FAILURE

Lea County: Amerada 1 H. S. Record, 26-19s-35e, elev. 3,716 ft., Yates 3,445 ft., dry, TD 3,499 ft.

MISSISSIPPI

Baxterville Field May Have New Producing Zone

JACKSON.—A core in the Wilcox at 4,780-5,224 ft. has established the Wilcox as a possible producing zone in the Baxterville field, Lamar County. The core was taken at the Gulf Refining Co. 1 Virgil Davis, 664 ft. south and 742 ft. west of the northeast corner of SE 7-1n-16w. Gas odor was noted at 4,844 ft. The section from 4,844-62 had thin sand streaks, with gas odor and taste, in the shale. A drill-stem test in porous gas sand at 4,862-70 ft. recovered gas and condensate. Coring is being continued below 5,224 ft.

The third drill-stem test at 7,300-20 ft. at the Humble Oil & Refining Co. 1 Adams City Board of Supervisors, 660 ft. north and 1,880 ft. west southeast corner of 47-6n-1w, wildcat in Adams County, recovered 180 ft. of mud and 5,170 ft. of salt water. Mud and salt water was recovered from two previous drill-stem tests at 4,635-55 ft. and at 6,282-6,300 ft. Operators are drilling below 7,512 ft.

Sohio Petroleum Co. and Roeser & Pendleton 1 Baker-Maier, 34-6n-2w, completed wildcat in Adams County, is now flowing 21 bbl. oil and 263 bbl. salt water per day with tubing pressure of 305 lb. and gas-oil ratio of 7,240 to 1.

Mississippi reported no wildcat completions. The Gulf Refining Co. 1 Mrs. Eva Barber, SW SE 34-10n-9w, Eucutta field, was completed with an initial production of 209 bbl. and drilled to a total depth of 5,319 ft. The second field completion was in Heidelberg East. The well is the Sun Oil Co. 1 Dr. P. C. Risher with an initial production of 240 bbl. and drilled to a total depth of 5,029 ft.

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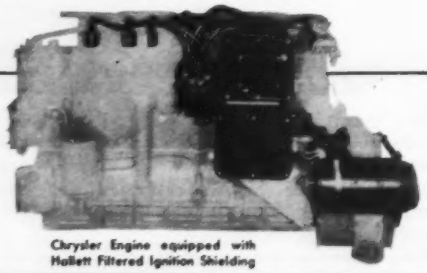

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TEXAS GULF COAST

General Crude Oil Opens New Gas-Producing Sand

HOUSTON.—General Crude Oil Co. has opened a new upper sand in Lane City field in Wharton County which is producing gas. The 8 Security Bank & Trust Co. located in the S. Castleman Survey 5, Block 103, 750 ft. northeast of the 3 well, is shut in, waiting on a potential of the gas flow. This test was drilled to a total depth of 5,503 ft., and 5½-in. casing was cemented on bottom. Gas is through 16 perforations at 4,154-56 ft.

Moran Corp.-Gar-Flo Oil Co. 2 Gibbs Bros., in J. J. Crowson Survey, Abstract 121, is reported to have extended the recently opened East Huntsville pool of Walker County, 1,320 ft. to the southeast. Operators are withholding the information. but it is reported this well flowed approximately 38 bbl. of oil daily through a ¼-in. choke before sanding up. Moran has made location for 3 Gibbs Bros. in the Benson Resinhover Survey, Abstract 456, 1,320 ft. north of the discovery.

Gulf Oil Corp. is testing new sand in its 17 C. W. Burrell, in the W. H. Smith Survey, Abstract 198, in Fannett field, Jefferson County. Total depth is 6,830 ft., and the 5½-in. casing is cemented to 6,304 ft. Perforations were made from 6,184-6,200 ft. for an initial test.

Sun Oil Co. 1 First National Bank of El Campo, in the Midfields discovery area of Matagorda County, flowed a potential of 226 bbl. daily through a ⅛-in. choke with 2,350 lb. tubing pressure, and a gas-oil ratio of 1,700 to 1. Total depth is 9,200 ft., and 5½-in. casing cemented on bottom with 12 perforations at 9,132-35 ft. This well is 2,100 ft. northwest of the 2 Strnadel discovery well of Midfields pool. Sun has built derrick at 1 Anna Spur and B. W. Trull, outpost test at Midfields, 3,000 ft. southwest of the discovery well, in I&GN Survey, Section 4, Block 6.

A 7,500-ft. wildcat test has been located in the Bellaire area of Harris County, southwest of Houston, by J. Leonard Davidson. The 1 Joseph F. Meyer is in the John Ely Survey, ¾ mile southeast of Rutledge & Clark 1 Joseph F. Meyer, dry hole.

Stanolind Oil & Gas Co. 69-A Cade, on the west flank of High Island field in Galveston County, has been completed for

a potential of 513 bbl. of oil daily through a ¼-in. choke with 775 lb. flowing pressure on the tubing. Production is through 30 perforations from 5,520-30 ft.

There were 11 new locations reported this week, 4 being wildcats, 2 in Fort Bend County and 1 each in Hardin and Harris counties. Fort Bend and Matagorda counties each received two locations. All completions were in proven areas with Wharton County leading with four completions, two in South Hillje field and one each in North Louise and Lane City fields.

N. CENTRAL TEXAS

Archer County Discovery Producing 206 Bbl. Daily

WICHITA FALLS.—H. W. Snowden 1 J. E. Morrison, Block 1823, TE&L Survey, Caddo discovery 7 miles northeast of Olney, Archer County, has been completed to flow 206 bbl. of 41-gravity oil daily through 26/64-in. tubing choke. Gas-oil ratio was 401 to 1. Casing pressure was 600 lb. and tubing pressure 175 lb. The discovery has been shut in since the first of the year. Caddo was topped at 4,487 ft. and the Mississippian at 5,220 ft. It was drilled to 5,236 ft. but plugged back to the Caddo for completions. Production is through perforations from 4,485-4,530 ft.

A shallow discovery in central Archer County is the Smiley-Norwood Oil Co. 1 Harris, Block 71, Harris Subdivision of Club Ranch, 7 miles southwest of Archer City. It has been completed for 50 bbl. of oil per day from oil sand from 1,122-26 ft. Operator has offset the discovery to the north.

Fain & McGaha 1 Huff, Michael Fanning Survey, wildcat 3½ miles east of Holliday, northern Archer County, is dry at 4,397 ft. A 45-minute drill-stem test from 4,240-86 ft. recovered 90 ft. of mud and 90 ft. of oil-cut drilling mud. However, no other shows were reported below that depth.

Charles E. Morrison will drill a 5,500-ft. wildcat 6 miles south of Seymour in southern Baylor County. It is 1 C. B. Richardson, 330 ft. from the north and west lines of the B. Gilen Survey, Abstract 149. Standard Oil Co. of Texas 1 Mitchell, J. B. McNair Survey, wildcat 2 miles north of Sherman in northern Grayson County, was reaming at 7,625 ft. Total depth is 8,174 ft.

Wilson field, Cooke County, and Electra field, Wichita County, each had five completions this week, and Holliday field, Archer County, had three. Electra field had seven locations, Ross field, Clay County, four and Sunshine Hill and KMA-Ellenburger fields, Wichita County, National field, Wilbarger County, and Wilson field each had two. Knox field, Young County, and National field each have seven drilling wells; Cooper field, Archer County, and Sivell's Bend field, Cooke County, each six; Nocona field, Montague County, five, and Hildreth field, Montague County, four.

In West Central Texas, Noodle field, Jones County, Nail field, Shackelford County, and Ingram field, Taylor County, each had one completion. Noodle field and Cisco field, Eastland County, each had one location. Stephens County Regular field has five drilling wells; Cisco field three, and Silver Valley field, Coleman County, Loving field, Stephens County, and Reddin field, Taylor County two each.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Archer County: Bridwell Oil Co. 1 W. Duckworth, Lot 5, Harris Subd. of Club Ranch, 6 mi. N and E Megargel, dry, TD 1,431 ft.

Clay County: Gus Blakely 1 Rosco Scott, Blk. 69, Wood CSL, 1 mi. N Postoak, dry, TD 1,210 ft.

Foard County: Magnolia 1 Rosannah Steele, Sec. 307, Blk. A, H&TC Sur., 7 mi. SE Crowell, elev. 1,361 ft., Mississippian 5,344 ft., Ellenburger 5,630 ft., dry, TD 5,682 ft.

Haskell County: Fred Manning et al 1 Carrigan & Jones, Sterling C. Robertson Sur., 7 mi. E and 5 mi. S McConnell, elev. 1,525 ft., Palo Pinto 3,280 ft., dry, TD 3,320 ft.

Jack County: Hanlon-Buchanan et al 2-A H. P. Briley, B. C. Finley Sur. A-222, 5½ mi. N and 1 mi. W Jermyn, elev. 1,092 ft., dry, TD 645 ft.

Hanlon-Buchanan et al 2 J. D. Gillespie, J. B. McNeil Sur. A-1796, 4½ mi. N Jermyn, dry, TD 600 ft.

King County: Humble 1 Anna M. Masterson, Sec. 19, IRR Co. Sur. A-316, 6 mi. E and 10 mi. N Guthrie, dry, TD 5,869 ft.

Knox County: Youngblood & Foree 1-A Ross Bates, Sec. 1, Blk. 2, D&W Sur., 2 mi. E and 1½ mi. N Goree, elev. 1,355 ft., dry, TD 1,620 ft.

Wichita County: D. H. Bolin 1 L. B. Slaughter, Blk. 315, Waggoner Colony Lds., 7 mi. N and 3½ mi. E Electra, dry, TD 2,534 ft.

Carl Johnson 1 Paul R. Brown, Blk. 311, Waggoner Colony Lds., 5 mi. N and 3

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, General Land Office, Washington 25, D. C. Notice is hereby given that sealed bids will be received until noon on Wednesday, May 29, 1946, for lots 13, 14, 15 sec. 8, T. 3 N., R. 91 W., 6th P. M., 128.63 acres, within the known geologic structure of the Thornburg gas field, Colorado. This land is offered as a single parcel to the qualified bidder of the highest cash amount per acre as a bonus for the privilege of leasing the land under section 17 of the leasing act as amended by the Act of August 21, 1935 (49 Stat. 674, 30 U.S.C. sec. 226). Each bidder must submit with the bid one-fifth of the amount bid in cash, or by certified check made payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease, required under 43 CFR 192.19. The envelopes should be plainly marked "Bid for lease in Thornburg gas field, Colorado. Not to be opened before noon, May 29, 1946." No bids received after the hour fixed herein for receiving bids will be considered. The remainder of the bonus and the annual rental at the rate of $1 per acre must be paid and a $5,000 corporate surety bond must be furnished by the successful bidder prior to the issuance of the lease. The deposits of the other bidders will be returned upon acceptance of the successful bid by the Secretary of the Interior. The successful bidder will be required to agree not to discriminate against any employee or applicant for employment because of race, creed, color, or national origin, and to require an identical provision to be included in all subcontracts. Bidders are warned against violation of section 59, U. S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids in the discretion of the Secretary of the Interior. Fred W. Johnson, Commissioner.

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WEST CENTRAL TEXAS WILDCAT FAILURES

Callahan County: Boyd Gillespie 1 Tom Windham, Sec. 145, BBB&C Sur., 3¾ mi. SE Baird, elev. 1,712 ft., dry, TD 1,226 ft.

Jones County: Oscar Donley 1 J. M. Higgs, Sec. 3, Blk. 15, T&P Sur., 1½ mi. NW Nugent, elev. 1,617 ft., dry, TD 2,300 ft.

Geo-Chemical Sur., Inc., et al 1 D. H. Jefferies, Sec. 4, Blk. 17, T&P Sur., 2¼ mi. S Truby, elev. 1,715 ft., dry in Swastika, TD 2,802 ft.

Stephens County: F. K. Johnson and Roeser & Pendleton 1 J. P. Phillips, Sec. 69, Blind Asylum Land, 1 mi. W Eolian, Caddo 3,561 ft., dry in Ellenburger, TD 4,318 ft.

ROCKY MOUNTAIN

Iles Field May Produce From Weber Sand

DENVER.—Indications are favorable for the opening of a new Weber sand pool in northwestern Colorado in Stanolind Oil & Gas Co. 1 Madison NW SW SE 22-4n-92w, Iles field, Moffat County. The Weber top was picked up at 4,572 ft. and cored at 4,577-84 ft., recovering 4 ft. of fine grained, tight, oil stained sand. The next at 4,584-95 ft. had a recovery of 7 ft. The top 5 ft. was fine grained, hard, tight sand with spots of oil staining; 1 foot bleeding with oil and gas, and 1 foot of tight sand. A drill-stem test was attempted at 4,574-95 ft., open 17 minutes when the packer failed. The recovery was 90 ft. of mud with a good show of oil. An additional foot then was cored at 4,595-96 ft., but there was no recovery. It was drilling ahead at 4,609 ft. at last report and preparing to take another test. In the Rangely field, saturation is encountered 75 ft. or more below the top of the sand.

The Iles test may be of great importance. It is in a district where very little testing of the Weber sand has taken place. That horizon was drilled at Wilson Creek 12 miles to the south and some saturation found around 8,000 ft., but the sand had little porosity. The Weber was dry at Maybelle 25 miles to the northwest, and at Meeker 20 miles to the south. However, the last two tests showed nothing of value in upper horizons.

Iles, on the other hand, has produced close to 12,000,000 bbl. of oil from the Morrison and Sundance sands. Six miles northeast of Iles the Moffat field producing from the Dakota and Sundance, never has been tested to the Weber. Likewise, Thornburg dome, 10 miles southeast, produces gas from upper horizons. In addition to these pools, there are a number of structures in the general area which either have not been tested or have not been drilled to the Weber.

Southeastern Colorado play.—Pure Oil Co. is reported preparing to drill on its tri-state block in the northeastern corner of Union County, New Mexico, northwestern corner of Cimarron County, Oklahoma, and southwestern corner of Baca County, Colorado. The block in Union County, upon which the test will be drilled, has been unitized with 33,030 acres in the unit. The acreage across the state lines in Colorado and Oklahoma has not yet been unitized.

The location for the first test probably will be in section 24 or 25-31n-36e, or in section 19 or 30 on the east, these being the top sections. The structure lies approximately 30 miles south of the south line of the Freezeout Creek block of 115,000 acres in Baca, Bent and Las Animas counties, Colorado, held jointly by Frontier Refining Co. and J. M. Huber Corp. The Tri-State block lies 25 to 30 miles west of Pure's operation in the Keyes field in Cimarron County, Oklahoma.

Church Buttes well tested.—While Mountain Fuel Supply Co. is still reluctant to release information concerning its 1 Unit C SW NW 8-16n-112w, the Church Buttes discovery well, it is reliably reported that a test through perforations in the Dakota-Lakota sands had an estimated flow of 60,000,000 cu. ft. of gas per day with 400 to 600 bbl. of condensate or crude oil.

Rangely field.—Texas Co. 6-21 Union Pacific, SW NW 21-2n-102w, elevation 5,315 ft., an outpost on the north side of the field, had the top of the Weber at 6,088 ft., and was drilled to 6,611 ft. On a drill stem test at 6,578-6,605 ft., open 55 minutes, there was a recovery of 180 ft. of fluid, 75 per cent salt water, no oil or gas.

Continental Oil Co. 2 Dorothy Rooth C SW SW 15-2n-103w, south offset to 1 Rooth, which extended the field 1½ miles to the northwest, had top of the Dakota at 4,215 ft., about 63 ft. lower than in the well to the north. This may mean that the axis on the west side may not swing as far south as was indicated in 1 Rooth.

New operations.—Twelve new operations were reported, 4 in Colorado, 2 in Wyoming, 5 in Montana, and 1 in northwestern New Mexico. The Colorado locations were in the Rangely field. The Wyoming locations were in Big Muddy and Frannie. Five in Montana included 2 in Cut Bank and 1 in Cat Creek and 2 wildcats in the Devon and Grandview districts. The Devon location is Linville 2 Smith-Lewis, C SW SW 26-33n-2e, north of the developed area. The other is Union Oil Co. 1 Danielson, NE NE NW 8-34n-2e, in the Broadview or East Kevin-Sunburst district. The New Mexico location is a wildcat, Miller & Miller 1 Mitchell, Section 33-4n-8e, Torrance County, which is rigged and waiting for casing for a 6,000-ft. test before spudding.

Completions.—There were 6 completions, 2 oil wells, 1 gas well and 3 dry holes. The oil wells were in Rangely in Colorado,

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and Pondera in Montana. Two dry holes were wildcats, 1 each in Colorado and Montana.

COLORADO WILDCAT FAILURE

Red Mesa, La Plata County: J. E. Dinger 3 Pinon Mesa, NE NE SE 27-33n-12w, TD 3,362 ft., dry in Dakota, temporarily abandoned.

MONTANA WILDCAT FAILURE

Lepper, Petroleum County: Ike Taylor 1 Fraser, SE SE NE 15-13n-27e, TD 2,813 ft., all sands dry down to and including the Ellis. Plugged and abandoned.

ILLINOIS

O'Hara Lime Shows for Producer in Clay County

MATTOON.—A new pool, producing from a new pay for the area, looked likely between the Bible Grove and Sailor Springs pools, as M. V. Duncan, Inc., 1 Gibson, NW NW SE 2-4n-7e, Clay County, recovered 2,095 ft. of clean oil, 205 ft. of oil cut mud, and no water, on a 1 hour drill-stem test in the O'Hara limestone at 2,892-2,902 ft., after backing up from 2,984 ft., total depth, to make test.

Of the two Hamilton County hot wildcats, the Dirickson et al 1 Flannigan, SW NE SE 28-6s-5e, did not look so good on drill-stem test. A 1-hour drill-stem test in the Aux Vases at 3,221-46 ft., recovered 1,300 ft. of gas, 240 ft. of oil and gas cut mud with a salty taste. A 2 hour and 15 minute drill-stem test at 3,238-56 ft. recovered 95 ft. of oil cut mud, and 390 ft. of salt water. A 1 hour and 15 minute drill-stem test in the McClosky at 3,315-53 ft., recovered 20 ft. of drilling mud. The other well, H. C. Hageman et al 1 McGee, SW NW NW 3-7s-5e, is rigging up cable tools, after setting 7 in. casing at 3,444 ft., through the McClosky.

ILLINOIS SUCCESSFUL WILDCAT

Wayne County: Deep Rock Oil Co. 1 Spicer, SW SW NE 25-1n-5e, pumped 12 bbl. oil, McClosky 3,072-75 ft., 2,500 gal. acid, TD 3,086 ft.

ILLINOIS WILDCAT FAILURES

Coles County: Nation Oil 1 R. H. Snider, NW NW NE 26-14n-10e, dry at 1,045 ft., Devonian 1,002 ft.

Jim Early et al 1 Catherine Carcoll, SE NW NE 36-14n-10e, dry at 980 ft., Devonian 968 ft.

Schoenfeldt-Hunter-Kitch 1 Meyer, NW NW SW 35-13n-8e, dry at 2,249 ft., Glen Dean 1,866 ft., Barlow 1,964 ft., Cypress sand 2,036 ft., Renault 2,140 ft., Aux Vases sand 2,147 ft., Ste. Genevieve 2,188 ft., Rosiclare 2,215 ft.

Edwards County: R. E. Johnston 1 A. Liddle, SE SE NW 19-1n-14w, dry at 3,235 ft., Ste. Genevieve 3,117 ft., McClosky 3,149 ft.

Jefferson County: Essex Royalty Corp. 1 Carpenter, NW NE SE 3-1s-1e, dry at 2,397 ft., Glen Dean 1,752 ft., Barlow 1,925 ft., Ste. Genevieve 2,278 ft.

Lawrence County: George Engle 1 Grounds, NE NW NW 22-2n-12w, dry at 1,912 ft., Tar Springs 1,560 ft., Glen Dean 1,649 ft., Hardinsburg sand 1,695 ft., Golconda 1,745 ft., Barlow 1,825 ft., Cypress sand 1,906 ft.

Marion County: C. C. Hutchins 1 Dieckman, NE NW NE 26-4n-2w, dry at 1,352 ft., Glen Dean 989 ft., Barlow 1,104 ft., Cypress sand 1,152 ft., Benoist 1,274 ft., Aux Vases sand 1,320 ft.

Shelby County: Pana Oil & Gas Co. 1 Drain, SE SE SE 16-10n-1e, dry at 1,507 ft., Vienna 1,260 ft.

Wayne County: George Engle 1 Kincaid, SW NW NE 23-2n-9e, dry at 3,223 ft., Barlow 2,787 ft., Cypress sand 2,858 ft., Paint Creek 2,948 ft., Benoist 3,034 ft.,

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OHIO, KENTUCKY

Muskingum County Well Rated as Encouraging

COLUMBUS.—Wasson et al completed an encouraging well on Ora Staker, Section 28, Salt Creek Township, Muskingum County. Medina sand, topped at 4,220 ft. and drilled to 4,228 ft., was shot and produced 65 bbl. the first day. The 40-acre spacing, high recovery, and the premium on Pennsylvania-grade oil makes this area attractive for the oil producers.

In Madison Township, Perry County, Ohio Fuel 1 Harkness, Section 22, flowed 47 bbl. and swabbed 28 bbl. the first 21 hours after shot.

At Somerset, Davis et al 1 H. J. White, Section 2, Reading Township, Perry County, made 32 bbl. In the same township, Pure Oil 2 J. F. Ford, Section 2, made 34 bbl.

In the Big Prairie pool, Ohio Fuel 1 Elmer Spring, Section 32, Ripley Township, Holmes County, found the Clinton at 3,121-43 ft., and gaging 1,230,000 cu. ft. when shut in after shot.

Twenty-eight locations were reported for the week, divided among the fields as follows: Cambridge eight, Ashland seven, Stewart five, Sandyville three, Mt. Vernon and Brush Creek two each, and Lancaster one. Of the 27 completions, Ashland, Cambridge, and Lancaster each had 6.

OHIO WILDCAT FAILURES

Ashland County, Perry Township: Roy Stewart 1 W. C. McHaffey, Sec. 4, Clinton, no sand, TD 3,031 ft.

Tuscarawas County, Clay Township: Frank Lyons et al 1 Eugene Roth, Sec. 19, Oriskany, no sand, TD 3,902 ft.

EASTERN KENTUCKY ACTIVITIES

ASHLAND. — Two dry-hole completions and two wells with a total of 449,000 cu. ft. of gas, were noted in eastern Kentucky activities during the week ending May 4.

Kentucky-West Virginia Gas Co. reported dry on well 761, Betty Shepherd, Magoffin County, total depth of 2,928 ft.; also dry on Wilson Damron well 5,628, Pike County, total depth 3,595 ft.

Kentucky-West Virginia Gas Co. completed well 5,209, William Cox (OWDD), Knott County, total depth 3,111 ft., open flow 189,000 cu. ft. in shale, after shot. Same company completed well 5,632, Eli Crum property, Martin County, total depth 2,596 ft., open flow 260,000 cu. ft., shale, after shot.

WESTERN KENTUCKY

OWENSBORO.—Two new wildcat locations were announced this week, while two other wildcats looked disappointing, although not yet abandoned. In Daviess County, M. B. Daly 1 Brooks Heirs, 6-N-29, elevation 394 ft., is shut down at 1,218 ft. In Fulton County, G. H. Froderman 1 Eliza Cook, 14-A-8, two miles northwest of Fulton, is shut down at 1,853 ft. In Crittenden County, J. L. Kennard et al have made location for 1 Rachel Etheridge, 10-J-18, eleven miles southeast of Marion. J. V. Canterbury has made location for 1 W. B. Holt, NW SW 12-O-18, in Union County, 2 miles north of Spring Grove.

WESTERN KENTUCKY WILDCAT FAILURE

Henderson County: Fisher Oil Co. 1 Barker, 8-O-22, 1 mi. south Corydon, dry, TD 2,652 ft., elev. 423 ft., Cypress 2,239 ft.,

Aux Vases sand 2,558 ft., St. Genevieve 2,567 ft., McClosky 2,647 ft.

INDIANA

EVANSVILLE.—The Wheeling pool, Pike County, received a 1½-mile northeast extension, when W. L. Lichlyter et al 1 Ada Conley, E ½ SW NW 3-1s-9w, pumped 165 bbl. of clean oil from the Cypress sand at 1,055-58 ft. The well has not been shot.

Carter Oil Co. is moving in materials for its wildcat test 1 Larkin, SE NE SW 17-6s-14w, in Posey County. Continental Oil Co. continued drilling ahead below 4,000 ft., in its deep test in the Griffin pool, after a drill-stem test at 3,782-96 ft., recovered only drilling mud. The formation was probably Osage. The well is scheduled for a 6,200-ft. test, and the Devonian is now figured due at about 4,500-600 ft.

INDIANA WILDCAT FAILURE

Gibson County: Texas Co. 1 Montgomery, SW SW NE 21-2s-11E, dry, TD 2,396 ft. Elevation 474 ft., cored McClosky 3,007-11 ft.

MICHIGAN

New Dundee Strike In Mecosta County

SAGINAW.—"The best Michigan strike in a year" was the state geological division's reaction to Rex Oil & Gas Co. 1 Skalitsky discovery in 8-14n-7w, Mecosta County. Topping the Dundee at 3,700 ft., and drilling in one foot, the well flowed 88 bbl. in an hour, then was shut in. The discovery is about 7 miles west of the Sherman-Isabella field and about 11 miles south of the Fork-Mecosta pool.

There were 20 completions this week, 6 oil producers, 2 gas wells and 12 dry holes. Best of the new wells was Holloway & White 3 Jankowski in Deep River-Arenac, which came in for 45 bbl. per hour. Five of the 6 wildcat completions were dry, the producer being a small gas well in Green Township, Mecosta County. While the growing Austin gas field in Mecosta County came in for extensive new development, 3 new tests in that area were dry.

Pure Oil Co. was getting ready to test its gas-distillate deep discovery in Garfield Township, Clare County. Twenty-two new locations were announced, 7 in the Austin gas field, Mecosta County; 3 in Van Buren County, 2 each in Bay, Isabella, and Allegan counties, and 1 each in Arenac, Barry, Genesee, Kent, Montcalm, and Osceola counties.

SUCCESSFUL MICHIGAN WILDCAT

Mecosta County, Green Township: Ashby Drilling Co. 1 Battle-Rekeny, NE SW SE 18-16n-10w; gas well, 1,600,000 cu. ft. per day, TD 1,245 ft.

MICHIGAN WILDCAT FAILURES

Barry County, Yankee Springs Township: Louis Zellman 1 Nomie Briggs, SW SW SW 8-3n-10w; dry in Traverse, TD 1,952 ft.

Kalamazoo County, Alamo Township: W. D. Gannett 1 Sills & Rozek, NE NE SE, 30-1s-12w; dry in Traverse, TD 1,390 ft.

Bay County, Mt. Forest Township: Sohio Petroleum Co.-C. W. Talbot 1 State-Mt. Forest, SE NE NE 1-17n-3e; oil show in Dundee, completed as dry hole; TD 3,057 ft.

Missaukee County, Aetna Township: Pure Oil Co. 1 Albert Bunning, C S½ SE NE 30-22n-6w; dry in Marshall, TD 1,457 ft.

Van Buren County, Pine Grove Township: Circle Drilling Co. 1 Joseph Geiger, NW NW NW 18-1s-13w; dry in Traverse, TD 1,326 ft.

OKLAHOMA

McClain County Well May Be Major Discovery

CARTER OIL CO.'s new Hunton lime discovery well, 6 miles east and south of Blanchard in McClain County, flowed 395 bbl. of oil in 6 hours through various choke sizes after tanks were installed. The discovery well, No. 1 Thompson, located in NE SE 36-8n-4w, made 48 bbl. of oil the first hour through ⅛-in. choke, cutting 8 per cent water and 4 per cent mud, against a tubing pressure of 650 lb. Further tests produced from 65 to 80 bbl. of oil an hour through 7/16-in. and ½-in. chokes.

The 1 Thompson logged a show of oil in the Hunton at 9,700 ft., had the Simpson lime at 10,465 ft., Viola at 10,120 ft., total depth was 10,592 ft. The well was plugged back, 7-in. casing set at 10,120 ft. and perforations made in the Chimney Hill section at 9,970-10,035 ft. The well flowed after acid treatment of 15,000 gal.

In Hughes County, east of the North Wewoka pool (Seminole County), Mid-Continent Petroleum Corp. 1 Rogers, NE SE SW 26-9n-8e, was drilling ahead below 3,610 ft. with a hole full of oil. A 40-minute drill-stem test at 3,259-70 ft. in Gilcrease sand showed gas immediately and recovered 450 ft. of oil and 50 ft. of mud.

OKLAHOMA SUCCESSFUL WILDCAT

Creek County: W. M. Dunn et al 1 Walker, NE NE SW 14-14n-10e, 35 bbl. from Dutcher at 2,945-54 ft., TD 2,954 ft.

OKLAHOMA WILDCAT FAILURE

Garvin County: Continental 1 Violet Gray, NW NE SE 15-1n-1e, dry at 4,472 ft., Basal Oklahoma City sand 4,422 ft.

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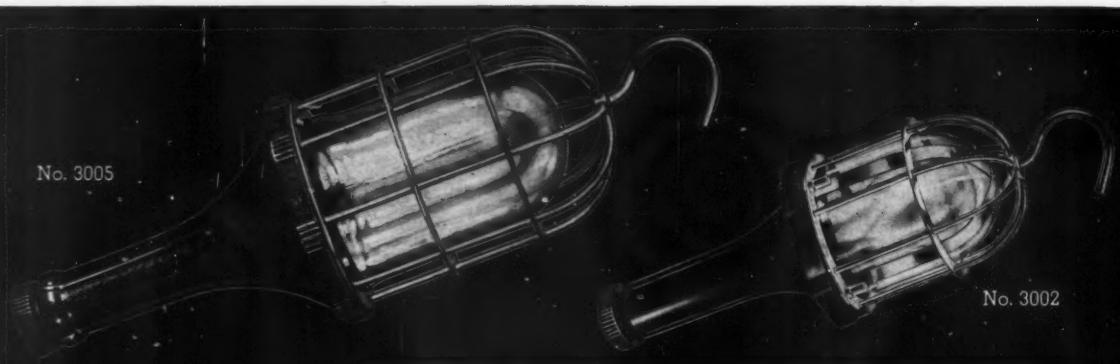

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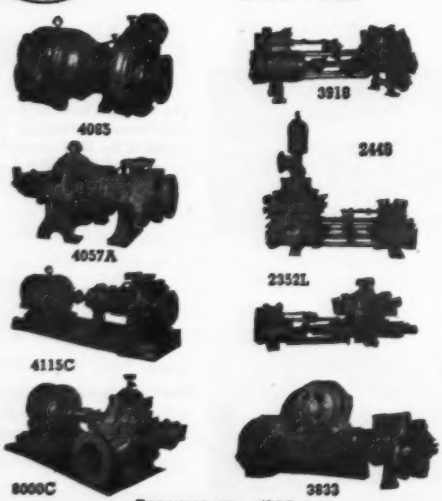

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LA.-ARK.

Twenty-Three Completions In North Louisiana

SHREVEPORT.—North Louisiana had the best week for completions in over 4 years, hanging up a total of 23, of which 18 were oil wells, 2 gas wells, and only 3 dry holes. The Delhi area accounted for nine of the producers, five in Delhi proper and four in Big Creek, with a total initial of 2,100 bbl. for the two fields. The other oil wells were accounted for by Caddo with four, East Haynesville two, Zwolle, Lake St. John, and Holly one each. Monroe and Lucky each contributed a gas well; Pleasant Hill and De Soto-Red River one dry hole each, and a Madison Parish dry wildcat completed the tally.

In Arkansas, operators are installing pump at the C. F. Steele 1 Waters, N½ NW NE 20-14-21, Nevada County wildcat, which bailed about 8 bbl. of heavy oil in the first hour after backing up from 2,246 ft., total depth, and perforating casing at 1,207-21 ft. The Wesson pool had one completion for 100 bbl. initial. Six new wildcat locations were announced, two in Nevada County, one each in Dallas, Drew, Logan, and Ouachita counties.

NORTH LOUISIANA WILDCAT FAILURE

Madison Parish: Press Cochran A-1 J. M. Frazier, SE NE SW 15-17n-10e, dry at 4,010 ft.

KANSAS

Stafford County Test Looks Promising

A DRILL-STEM test at 3,848-69 ft. recovered 720 ft. of oil-cut mud at the Cities Service Oil Co. 1 Kipp, NE NE NE 23-25-14w, wildcat in Stafford County. Pipe has been set to test shows in the Lansing marked at 3,659 ft. After drilling to the Arbuckle, the pipe was set at 3,977 ft. with plans to perforate opposite the Lansing. Nearest production to the test is the Kipp pool, 1 mile north and 1 mile east, and the Jordon pool, ½ mile south and 2 miles east.

Pipe has been set at 2,722 ft. to test the Fort Riley sands for gas production at the Ed Swearer 1 Brown, SW SW SW 4-26-23w, wildcat in Ford County. Plans are to test for gas before drilling deeper for oil production. The Fort Riley was topped at 2,721 ft. and the test drilled to a total depth of 2,727 ft.

The tenth wildcat location since the first of the year for Rooks County is the Don Ingling 1 Amos, NW NW SW 22-9-18w. Operators are drilling ahead below 2,720 ft. The wildcat is located in the south central part of the county and nearest production is in the Barry pool 5 miles northwest.

Another wildcat for Rush County is the Darby & Bothwell, Inc. 1 Ficken, NE NE SE 33-17-17w. Operators are drilling below 2,000 ft. The wildcat is in the east central part of the county. The Bison gas pool, which has been abandoned, is 1 mile to the south.

Kansas reported 49 completions of which 9 wildcats were dry. Of the 40 field completions, 23 were oil, 5 made gas and 12 were dry.

KANSAS WILDCAT FAILURES

Butler County: Deep Rock Oil 1 Hodge, SE SE NW 7-27-4e, dry at 3,085 ft., Arbuckle 3,065 ft.

E. H. Adair 1 Clark, NW NE SE 32-25-4e, dry at 2,652 ft., Viola 2,649 ft.

Decatur County: Helmerich & Payne 1 Bailey, NE NE NE 14-3s-27w, dry at 4,076 ft., quartzite 4,176 ft.

Ellsworth County: C. E. Ash 1 Linke "A," SE SE SW 29-17-8w, dry at 3,362 ft., Viola 3,295 ft.

Graham County: Tom Palmer 1 Parker, SW SW SW 36-6-21w, dry at 3,794 ft., Arbuckle 3,774 ft.

Phillips County: Helmerich & Payne and Tide Water 1 A. C. Kenter, SW NW NW 20-4s-19w, dry at 3,832 ft., Granite Wash 3,805 ft.

Rooks County: Goodpasture Drilling et al 1 Le Sage, SE SE NE 18-7-20w, dry at 3,604 ft., Arbuckle 3,575 ft.

Sheridan County: H & T Drilling Co. 1 Harold, SW SW 11-6-28w, dry at 4,529 ft., Arbuckle 4,519 ft.

Stafford County: Plains Exploration 1 Waples, SE SW SW 13-23-12w, dry at 3,835 ft., Arbuckle 3,816 ft.

CALENDAR

May

Natural Gas and Petroleum Association of Canada, Windsor, Ont., May 22-23.

National Oil Scouts and Landmen's Association, Jackson, Miss., May 23-25.

June

Society of Automotive Engineers, semi-annual meeting, French Lick, Ind., June 2-7.

American Gas Association, gas production and chemical committees, joint conference, Hotel Pennsylvania, New York, June 3-5.

Houston Nomads, River Oaks Country Club, June 4.

Pennsylvania Oil Producers Association, Bradford district, fifteenth annual meeting, Pennhills Club, Bradford, Pa., June 6.

A.P.I. division of production, Mid-Continent district meeting, Skirvin Hotel, Oklahoma City, June 6-7.

Kentucky Oil and Gas Association, annual meeting, Hotel Lafayette, Lexington, June 7-8.

Los Angeles Nomads, Mayfair Hotel, June 12.

A.P.I. division of production, spring meeting, William Penn Hotel, Pittsburgh, June 13-14.

Federal Power Commission hearing in the natural-gas industry investigation, Washington, June 17.

Canadian Gas Association, thirty-ninth annual convention, Murray Bay, Que., June 17-19.

American Society for Testing Materials annual meeting, Buffalo, June 24-28.

Pennsylvania Grade Crude Oil Association, twenty-third annual meeting, William Penn Hotel, Pittsburgh, June 27-28.

July

Houston Nomads, River Oaks Country Club, July 2.

Los Angeles Nomads, annual meeting and party, Mayfair Hotel, July 10.

August

Houston Nomads, River Oaks Country Club, August 6.

Interstate Oil Compact Commission, quarterly meeting, August 8-10, Grand Rapids, Mich.

American Institute of Chemical Engineers, western convention, Palace Hotel, San Francisco, August 25-28.

September

Houston Nomads, River Oaks Country Club, September 3.

Sixth annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va., September 9-11.

Los Angeles Nomads, Mayfair Hotel, September 11.

National instrument conference, sponsored by Instrument Society of America, William Penn Hotel, Pittsburgh, September 16-20.

National Petroleum Association, forty-fourth annual meeting, Hotel Traymore, Atlantic City, N. J., September 18-20.

October

American Association of Oilwell Drilling Contractors, sixth annual meeting, Plaza Hotel, San Antonio, Tex., October 1-2.

Houston Nomads, River Oaks Country Club, October 8.

American Gas Association, annual meeting, Atlantic City, October 7-12.

Los Angeles Nomads, Mayfair Hotel, October 9.

Texas Mid-Continent Oil and Gas Association, Rice Hotel, Houston, October 16-18.

Seismograph Service Announces Formation Of Subsidiary

Seismograph Service, Ltd., a British subsidiary of Seismograph Service Corp., has been incorporated under the laws of the United Kingdom, to operate in the sterling area, it was announced by G. H. Westby, president of S.S.C. The sterling area includes such important oil producing regions as the Middle East, Netherlands East Indies, Burma, and the Island of Trinidad.

Although operating headquarters will be in London, the general policies of the new subsidiary will be controlled from Tulsa, and all stock-

VAN DER LINDEN

WOODBURN

holders' and directors' meetings will be held here. Operations will be in charge of E. J. P. van der Linden, managing director; James E. T. Woodburn, manager of field operations; and Victor Graf, manager of instrumentation. English attorneys will be Freshfields, a distinguished firm which has served as solicitors to the Bank of England for over 200 years. In addition, three Tulsa men will serve as directors; Westby; T. A. Manhart, executive vice president of S.S.C.; and John S. Carlson, general counsel of S.S.C.

Van der Linden was formerly associated with S.S.C.; Woodburn was formerly chief geophysicist of Skelly Oil Co.; and Graf only recently returned to S.S.C., after being on leave during the war for special work with the Naval Ordnance Department. These three men will hold a substantial stock interest in the new subsidiary, with the remaining stock all held in the United States, the controlling interest being retained by S.S.C.

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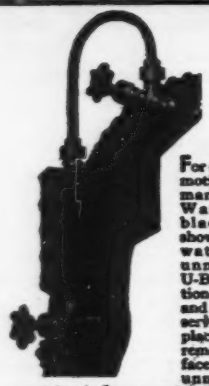

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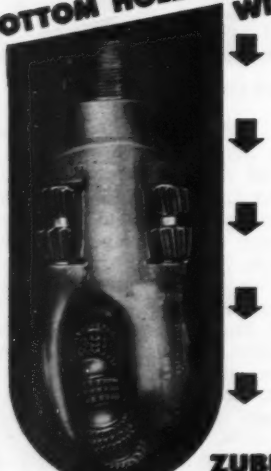

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Among the

Drilling Contractors

Mercury Drilling Co. has been contracted to drill the British American Oil Producing Co. Carthage Unit No. 111 in the Carthage gas field, Panola County, Texas. Mercury has just set production string at 6,600 ft. on the same company's Unit No. 112.

Warren-Bradshaw Drilling Co. is moving in material at the Carter Oil Co. 1 Eskridge in NE NW SW 19-14n-2w, Garvin County, Oklahoma.

C. F. Clapsaddle Drilling Co. will drill the Walter Blow 1 Robert T. Martin in SW SE 8-38n-3w, La Porte County, Indiana.

Brown & Tomer Drilling Co. has been contracted by Woodward Oil Co., to drill a gas test of the Chilson Anticline in the Ardmore structure, in Fall River County, South Dakota. Location of the test is in NW NW 9-12s-4e.

John W. Osteen Drilling Co. has been contracted to drill the A. S. Mims 6 R. Newman in SW NE 36-6s-12w, Posey County, Indiana.

Biddle Drilling Co. has the contract to drill the T. C. Johnson Estate 12 Bitter in S/2 S/2 NW 8-16-13, Trapp field, Barton County, Kansas.

Dee Miller Drilling Co. is moving in rotary tools at the Clarence Angle 1 E. A. Pyle in NE NE NE 24-5s-8e, White County, Illinois.

Merrill Drilling Co. has been contracted by Lowell Bernhardt and Merrill Drilling Co. to drill the 1 John Malek in SE NE SW 15-9n-1w, Gratiot County, Michigan.

Wakefield Drilling Co. was the contractor at the Cooperative Refinery Association 3 Kennedy in SW SW SW 12-30-5e, Cowley County, Kansas.

Brown & Eakle Drilling Co. is running up rigging at the Phillips Petroleum Co. 5 Dallas in SE NW NW 28-6s-10e, White County, Illinois.

Thorne Drilling Co. is drilling at 2,140 ft. at the Calstar Petroleum Co. 1 Sara Neel in 6-P-23, Henderson County, Kentucky.

Archie Boling and E. K. Williams, former drilling-contractor partners in Michigan, are now operating independently.

C. B. Miller Drilling Co. will drill the R. E. Bradley 1 Leo Levette in SE SW SE 23-2n-13w, Allegan County, Michigan.

A. W. Hutchings Drilling Co. has been contracted by M. C. McGehee, Jr., to drill the 1 Hawkins Heirs in SE NE 23-1s-1w, wildcat in Evangeline Parish, Louisiana.

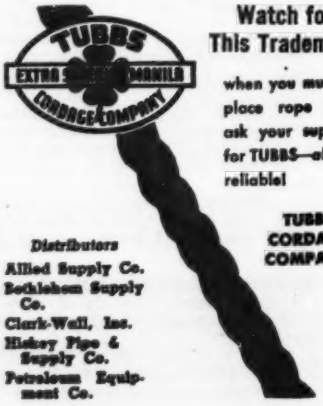
George & Wrather Drilling Co. has been contracted to drill the George S. Engle 1 John Hillyard in SW SW SW 27-2s-10w, Gibson County, Illinois.

E. W. Leeder Drilling Co. has the contract to drill the 1 Peter & Joseph Kayler in SE NE NE 2-1n-14w, wildcat in Allegan County, Michigan, for Stanley L. Findley.

Big Chief Drilling Co. is rigging up at the Globe Oil & Refining Co. and Vickers Petroleum Co. 1 Prim in NW NW SW 29-3n-2w, Garvin County, Oklahoma.

Arenac Oil & Gas Co. will drill the Fletcher & Leman 6 Martha Smith in SW SE SE 15-19n-4e, Deep River field, Arenac County, Michigan.

TUBBS
EXTRA MANILA
CORDAGE COMPANY



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Hickey Pipe & Supply Co.
Petroleum Equipment Co.

NEW 1945-1946 PETROLEUM REGISTER

The PETROLEUM REGISTER, national and international oil directory, recently issued its 24th Annual Edition, a complete revised record of all branches of the industry with detailed data on Producers, Drilling Contractors, Refiners, Pipe Lines, Marketers and Jobbers, Natural Gasoline Mfrs., etc.

Recent advertisements of the MIDWEST OIL REGISTER in oil journals has caused confusion among many in the industry, who, noting the similarity in names, believe it to be connected in some way with the PETROLEUM REGISTER.

THERE IS ABSOLUTELY NO CONNECTION WHATSOEVER BETWEEN THE TWO PUBLICATIONS.

The PETROLEUM REGISTER, pioneer directory of the oil and gas industry, was established in 1918. It sells for only $10.00 a copy postpaid.

Southwestern Bureau

THE PETROLEUM REGISTER

114½ So. Cheyenne Phone 2-6263

Tulsa 3, Oklahoma

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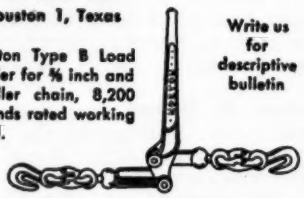
EQUIPMENT CO., Inc.

P. O. Box 1185

Houston 1, Texas

Norton Type B Load Binder for ⅝ inch and smaller chain, 8,200 pounds rated working load.



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Oklahoma City, Tulsa, Hobart, Woodward, McAlester

California Standard Plans New Production Laboratory

LOS ANGELES. — Proposed construction this year of a production-technology laboratory in Southern California for its producing operations was announced by Standard Oil Co. of California.

The new laboratories are to built adjacent to the Murphy-Coyote field, about 4 miles northwest of Fullerton, and will include five laboratory units and a group of offices. The building will replace temporary structures in which research and administrative work is now being done.

Contractor's bids are due on May 27, and California Standard engineers anticipate that construction will begin early in June. It is expected that the new building will require 7 months to complete.

The laboratories will be used primarily for study of drilling operation methods and problems related to recovery of crude oil in established fields.

Texas Underproduction 5.44 Per Cent in March

AUSTIN, Tex. — Texas crude oil production for March dropped 5.44 per cent below the allowable, according to the Texas Railroad Commission. Reported production for the month was 56,136,527 bbl., compared to the allowable of 59,368,156 bbl.

Under-production ranged from 2.22 per cent in East Texas to 13.7 per cent in North Texas and 13.17 per cent in the Texas Panhandle.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, General Land Office, Washington, 25, D. C. Notice is hereby given that sealed bids will be received until noon on Wednesday, May 29, 1946, for the SE¼NE¼ sec. 24, T. 12 N., R. 101 W., 6th P.M., 40 acres, within the known geologic structure of the West Hiawatha gas field, Colorado. This tract is offered to the qualified bidder of the highest cash amount per acre as a bonus for the privilege of leasing the land under section 17 of the leasing act as amended by the Act of August 21, 1935 (49 Stat. 674, 30 U.S.C. 226). Each bidder must submit with the bid one-fifth of the amount bid in cash, or by certified check, made payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease, required under 43 CFR 192.19. The envelopes should be plainly marked, "Bid for lease in West Hiawatha gas field, Colorado. Not to be opened before noon, May 29, 1946." No bids received after the hour fixed herein for receiving bids will be considered. The remainder of the bonus and the annual rental at the rate of $1 per acre must be paid and a $5,000 corporate surety bond must be furnished by the successful bidder prior to the issuance of the lease. The deposits of the other bidders will be returned upon acceptance of the successful bid by the Secretary of the Interior. The successful bidder will be required to agree not to discriminate against any employee or applicant for employment because of race, creed, color, or national origin, and to require an identical provision to be included in all subcontracts. Bidders are warned against violation of section 59, U. S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids in the discretion of the Secretary of the Interior. Fred W. Johnson, Commissioner.

The Multi-range *lightweight* BJ Type "T" Tong for Drilling or Production Rigs

Designed to lighten and speed up the job of running tubing, BJ type "T" tongs are equally valuable in "nippling up" or as lay tongs. Made in five series: A, B, C, D, and E, with available jaws in each series to handle API tubing and coupling sizes from 1" to 4", plain or upset.

Change in size of tong jaws can be made quickly and easily. The dies are self sharpening and provide a quick, positive, non-crushing grip. The handle is made of reinforced seamless tubing, and is designed to provide sturdy, balanced construction. Stabbed on, these tongs cannot come open even if hinge pin fails, yet jaws easily release by pulling back on the sleeve. Call your BJ supplier and let him equip your rigs with "T" tongs.

BYRON JACKSON CO.

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PROVED IN OIL FIELDS AND REFINERIES

'BESTOLIFE Lead Seal Joint Compound has been used successfully in the Oil and Refining industries for the past fifteen years. During that time, it has proved itself superior in protecting threads and in providing tight joints which can be broken easily.

Ample stocks of 'BESTOLIFE available at supply house field stores in every drilling district in the United States and Canada. Use 'BESTOLIFE Tool Joint Compounds for best results!

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PERSONALS

Galey Family Began Oil Business in Early 1860's

JOHN T. GALEY, Pittsburgh, Pa., geologist and producer, is the fourth generation in a line of independent oil and gas operators which started in the early 1860's at Parkers Landing, Pa.

Well-known for his experience in deep cable tool drilling through difficult shales, Galey is credited with the discovery, either individually or working with major companies, of a number of Oriskany gas pools in the Appalachian area.

Among them were those in South Beaver Township, Beaver County, Pennsylvania; Clay district, Hancock County, West Virginia; Knox Township, Columbiana County, Ohio; Goshen Township, Mahoning County, Ohio; and Madison Township, Columbiana County, Ohio.

Galey has made various contributions to the study of deep-sand possibilities, particularly the lower Devonian in the Appalachian section. He is the author of various compilations on drilling completions and production. He was graduated from Princeton University in 1932 with a B.S. degree and is a member of the American Association of Petroleum Geologists, the American Geophysical Union, and the Pittsburgh Geological Society.

Frank Kadlubowski has been transferred to the process department from the process control department of the Bayonne, N. J., refinery of Standard Oil Co. of New Jersey. He will work on wax and lube oil operations. Kadlubowski is a chemical engineering graduate of Syracuse University. **William Schoenhut** has been promoted to day foreman on wax sweating operations. He has more than 38 years of company service.

E. F. Lassauze, director, Societe Cherifienne des Petroles and chief of the mission of S. N. Marep (Societe Nationale de Materiel de Forage et d'Exploitation de Petrole) and **G. Semenoff,** engineer for S. N. Marep and chief of purchasing department for S.C.P., were slated to leave this country early this month for Morocco. **M. Schwob** will become mission chief of S. N. Marep with **J. Bertaux** as engineer.

Phil P. Gaby, former California supervisor for Geophysical Service, Inc., has joined Standard Oil Co. of California as a consulting geophysicist.

Dr. Gustav Egloff, engineer for Universal Oil Products Co., has been awarded a certificate of appreciation by the War Department for his work on the wartime consultants petroleum committee supplying information to the department on methods of refining and treating crude oil, gasoline, and natural gas.

Don Harlan, assistant division petroleum engineer, West Texas-New Mexico division of The Texas Co. Fort Worth office, has been promoted and transferred to the Houston office of the company on the staff of **Dr. W. V. Vietti,** who is assistant to **L. E. Barrows,** manager of the producing department in the Southwest.

Rene Perrin, Paris, France, president-director general of Compagnie Francaise de Raffinage, and **R. Van Den Perre,** New York representative of the company, visited the Texas Railroad Commission's Oil and Gas Division last week. The company has been purchasing crude from Nueces County, Texas, for refineries it operates near Marseilles and Le Havre

H. E. Granville has rejoined the Pan American Production Co. and will head its new district office in Abilene, Tex. **James R. Day** is the new district geologist there. Also as a part of the company's expansion program in Texas and Louisiana, other new offices will be headed by **R. R. Oliver** at San Antonio, Tex.; **R. J. Hurt** at the Shreveport, La., office, and **Homer Moore** at the Lafayette, La., office.

Ting Chang, Shanghai, China, who before the war was associated with the Kansu Petroleum Administration in Chunking, China, is now in the United States studying American drilling and exploration equipment. Chang, who recently visited the Failing Supply Co. plant at Enid, Okla., will return to China in a year to act as a government consultant on the purchase of oil-field equipment. He was brought to the United States by International Training Administration, Inc., Washington.

T. T. Otteson, who has been No. 1 operator at Shell Chemical Co.'s butadiene unit at Torrance, Calif., has been advanced to chief operator.

Robert P. Russell, president of Standard Oil Development Co., has been awarded the Army Medal of Merit, with accompanying citation from the president, and the Naval Ordnance Development Award for development of jellied gasoline, the portable and mechanized flamethrowers, and other incendiary weapons. Also named in the Navy award for exceptional service were **N. F. Myers, H. G. M. Fischer, M. D. Haworth, S. H. Hulse, J. O. Collins, G. W. Engisch,** and **R. L. Betts,** all of whom took part in the work on the flame-thrower by the development company.

Ralph L. Gray, Hobbs, N. M., has been elected president of the Lea, N. M., County Petroleum Society, recently organized to promote exchange of technical information in southeastern New Mexico. **H. J. Russell** is vice president and **R. S. Blymn,** secretary-treasurer.

W. D. Lane, with Plymouth Oil Co. 20 years, has been placed in charge of all West Texas operations—geological, land, drilling and production—at Midland. **C. D. Speed, Jr.,** Plymouth's chief geologist, has resigned and will

be succeeded by **W. W. LaRue,** now chief geophysicist and seismologist for the company.

C. O. Rowley has been appointed general superintendent of the Toledo refinery of Standard Oil Co. of Ohio. Other new appointments at the plant: **H. H. Chapman,** superintendent of the cracking department; **B. Horn,** superintendent of the utilities department; **B. E. Henry,** superintendent of the maintenance department; and **G. I. Ladd,** superintendent of the paraffin department.

H. W. Sheldon, general manager of the Paulsboro, N. J., refinery of Socony-Vacuum Oil Co., Inc., has been given the War Production Board's Citation of Merit for his services in connection with the national war salvage program.

Wallace B. Pardoe, Grand Rapids, Mich., independent operator, has been appointed general manager of McClanahan Oil Co., Inc. Pardoe has been associated with Sinclair Oil Corp., Asiatic Petroleum Co., and Shell Oil Co., Inc.

Warner Norton Grubb, area adviser for northern Europe, in the foreign marketing coordination department of Standard Oil Co. (New Jersey), has been awarded the Legion of Merit for wartime service in petroleum supply operations in Europe. He was a Navy commander during the war and for a time served as head of the Latin-American section of the Army-Navy Petroleum Board until he became tanker control officer of the staff of the commander of U. S. Naval forces in Europe in December 1943.

John O. Galloway, executive vice president of California-Standard Oil Co. and active for several years in Alberta development, has been named vice president of Alberta Petroleum Association, succeeding **P. F. Shannon,** recently transferred to New York.

Burton E. Whiteley has become a reservoir engineer in the production department of Sohio Petroleum Co. in the Oklahoma City division. Other new members of the division include **Wilbur L. Woodside,** senior draftsman in the mechanical engineering department, and **Cyril B. Smith,** geophysicist in the geological department.

Charles P. Baker has been appointed general superintendent of the East St. Louis refinery of Socony-Vacuum Oil Co., Inc. After graduating in chemical engineering from Texas A. & M. College in 1934, he was employed by Magnolia Petroleum Co. at its Beaumont, Tex., refinery. He entered the Army as a second lieutenant in 1942 and after 6 months was assigned to Petroleum Administration for War. He served as chief of the aviation section, refining division, with the rank of major.

George L. Neely has returned to Standard Oil Co. of California as manager of the lubricants division after service as a Navy commander

G. L. NEELY

B. W. PICKARD

on special "trouble shooter" assignments on engineering problems in the Pacific. At the end of the war, Neely headed a mission which studied the technical development and petroleum position of Japan. California Standard last week also announced **B. W. Pickard** has become manager of the gasoline and fuel oil division, succeeding **H. G. Vesper,** recently named president of California Research Corp.

A. C. Parks has been named operating vice president of Seminole Oil & Gas Corp. with offices at Wichita Falls, Tex., following Seminole's acquisition of the oil division of Candler-Hill Corp.

E. K. Anderson, superintendent of the El Dorado, Kans., refinery of Skelly Oil Co., has been appointed manager of refining of the company with headquarters in Tulsa. Other changes made to coordinate the company's refining activities within the refining division involve **L. C. Newton,** placed in charge of personnel and safety for the Longview, Tex., refinery at the time it is transferred to the refining division; **Justus O'Reilly,** formerly special assistant to **James W. Vaiden,** vice president in charge of manufacturing, made superintendent of the El Dorado plant; **J. Y. Haslam,** named chief engineer of the refining division; **C. E. Gore,** assistant superintendent, made superintendent of the lubricating and grease plants; **Howard Belew,** appointed assistant to Vaiden; **Paul Batholow,** grease plant foreman, made assistant superintendent of lubricating and grease plants; **R. B. Lewis,** named lubricating engineer under the superintendent of the lubricating and grease plants, and **Carl W. Demo,** promoted to grease plant foreman.

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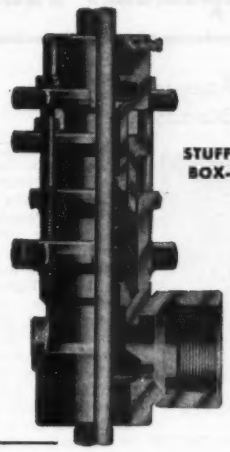

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In actual fields of operation, Hercules' exclusive "Cone Packing" has proved to be a time saver, as it practically eliminates friction . . . will not burn out or leak if well pumps off. This takes no account of time lost in repacking the ordinary box. Cone Packing has successfully withstood over 2,000 pounds pressure, and more important, will outlast old-style ordinary packing many times. Let Hercules Cone Packing prove its ability to meet your most exacting requirements!

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Equipment Men in the News

Cooper Announces New General Manager

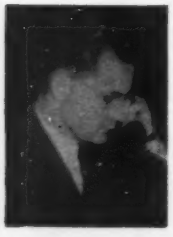
H. E. COOPER

Fred E. Cooper, Tulsa, manufacturer and distributor of Allis-Chalmers well-servicing equipment and power units to the oil industry, announces the appointment of Harold E. Cooper as general manager of the organization. Harold Cooper has been associated with the organization for the past 14 years, starting as a field salesman in 1932. In 1936 he became eastern division manager. In 1937 he became foreign sales representative and for the next few years visited most of the world's producing oil fields. In 1943 he transferred to the Tulsa office in charge of machinery sales, which position he filled until the new appointment.

Braden Steel Names Converse Vice President

Lynn C. Converse has been elected vice president of Braden Steel Corp., Tulsa. Converse will be in charge of manufacturing the complete line of Braden sectional steel prefabricated buildings and will supervise all plant facilities. Prior to assuming his present position he was in charge of the research and development department and since January 1943, has been production manager.

Murrey Appointed by Midwestern



O. E. (Ted) Murrey has been appointed vice president and sales manager of Midwestern Engine & Equipment Co., Tulsa. Formerly Murrey was in charge of Cardwell Manufacturing Co.'s pipe-line department. Midwestern Engine & Equipment Co. is Mid-Continent distributor of Continental engines, Fiberglas underground pipe wrap, Woolridge earth-moving equipment, and other pipe-line and oil-field equipment.

Koepke Transferring Headquarters

Boyd Koepke, representative for Aluminum Ore Co. of America, is transferring his headquarters from East St. Louis to Dallas. Koepke is well known among refining and equipment men and will be welcomed again to the southwest and Gulf Coast.

Born Moving Into Enlarged Quarters

The Born Engineering Co., Tulsa, is moving its offices to the Central Building, where greatly enlarged space and facilities will be available for its engineering and construction departments. Recent additions to the Born staff include Junius Markham, civil engineer; Harold J. Born, petroleum engineer, and Harold Reeves, chemical engineer.

Niblack District Sales Manager For Industrial Supply Co.

M. C. Niblack has been appointed district sales manager for the Oklahoma City area of Industrial Supply Co., Wichita Falls, Tex. For the past 20 years Niblack has been active in the oil-field supply business. From 1925-36 he was employed by Crane Co. at Tulsa. In 1936 he became associated with International Supply Co., which later became a part of Bethlehem Supply Co.

Alexander Made Sales Manager

Milwaukee Valve Co. announces the appointment of Bernard Alexander as general sales manager.

Solvay Opens Southwestern Branch

Solvay Sales Corp. has announced the establishment of a new office at 847 M. & M. Building, Houston. This new office will be in charge of Col. S. O. Taylor.

New Building for Roebling

John A. Roebling's Sons Co. of Illinois announces the erection of a modern office building and warehouse. The new building, designed for future expansion, is located at 5525 West Roosevelt Road, Chicago.

Lee C. Moore Announces Changes in Executive Personnel

N. F. ROHRKASTE

Lee C. Moore & Co., Inc., Pittsburgh, has announced the appointment of Norman F. Rohrkaste as vice president. He will assume executive affairs of the company in addition to his duties as secretary-treasurer, and will continue to be located in the Pittsburgh office. He has been with the company since 1920.

Homer J. Woolslayer has been appointed vice president charged with the general management of all the company's oil-country activities.

H. J. WOOLSLAYER

N. CHAPIN, JR.

Woolslayer has been with the company since 1923, having served as chief engineer since 1941. His headquarters will continue to be in Tulsa.

Newton Chapin, Jr., has been named manager of the industrial division of the company in Pittsburgh. This division is devoted entirely to the development and manufacturing of equipment other than for the oil-producing industry.

The company also announces the appointment of A. B. Dunham as sales representative at Wichita Falls, replacing Charles Geddes, resigned.

MALCOLM W. BLACK WILL REPRESENT COPPUS ENGINEERING CORP.

Coppus Engineering Corp., of Worcester, Mass., has announced the appointment of Malcolm W. Black & Co., New York, as exclusive domestic and export sales and engineering representatives in Greater New York and surrounding territory.

Coppus manufactures Fanmix gas and oil burners, steam turbines, mining and industrial ventilating equipment, and air filters.

Malcolm W. Black & Co. also represents Fisher Governor Co., Daniel Orifice Fitting Co., Peerless Manufacturing Co., and Continental Equipment Co.

Members of the Malcolm W. Black & Co. organization. Top row: James S. Kane, James E. Menah, Fred L. Grabbe, Al W. Bailey. Bottom row: Carley Nickel, Malcolm W. Black, Helen Dooms, Helen Campbell. Not in picture is William B. Wickersham

Classified Advertising

The Market Place for the Oil Industry

EQUIPMENT WANTED

WANTED: Reda Electric Cable. L. Smith Co., 215 N. Western, Oklahoma City, Oklahoma. 3-9046.

TANKS WANTED

4—10,000 to 15,000 gal. cap.
8—16,000 to 25,000 gal. cap.
3—2,500 to 5,000 bbl.

E. J. BOYCE
Pierce Bldg., St. Louis, Mo.
or
L. M. STANHOPE
Rosemont, Pennsylvania

EQUIPMENT FOR SALE

FOR SALE: New all-steel late model drill rig. Capacity 2,000 feet. 2½ ton Int. truck and tools. Price $5500.00. Rex Beyer, Diamond, Mo., Phone 84.

ROTARY TABLE, Ideco, 17¼, guaranteed, 4¼ sq. kelly drive. Emsco 6-AB swivel. Make offer. Box B-244, The Oil and Gas Journal, Tulsa, Oklahoma.

SULLIVAN #40 Core Drill, excellent condition, mounted on GMC six by six truck almost new with ten new 7:50x20 tires. Chevrolet water truck, low mileage, excellent condition, special built steel bed equipped with Lawson Little Giant centrifugal pumping unit. 675 gallon capacity tank. Equipment consists of 900′ drill stem, new spider foot clamp, all necessary wrenches and tools. Ready for immediate operation. Box B-246, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: LIGHT PLANT: 1—15KW Allis-Chalmers type E-100 120-volt direct current generator; 1—30 H.P. Cooper-Bessemer gas engine; switchboard; several thousand feet insulated copper wire on poles; also 1—12SKW Westinghouse type SK 120-volt generator. This plant now in use, can give immediate possession, priced for quick sale. Fort Worth Pipe and Supply Company, 2010 East Lancaster, Fort Worth, Texas.

FOR SALE: Allis-Chalmers model "UE" single drum tractor with special flanged drum, cathead, Ensign combustion carburetor, drum divider, etc. This unit is designed to service wells from 5,000′ to 6,000′ and pulls a four-wheel Spencer trailer complete with tool box and all small tools and a complete complement of rod and tubing tools and lines. It also has 6,000′ of ⅝" swabbing line and is now in operation at Crescent, Oklahoma. Complete price, $2,975.00. Standard Well Service, Box 1172, Oklahoma City, Oklahoma. Phone 3-8996.

STANDARD DRILLING OUTFIT, complete, A-1; steel rig, new Young 145 HP engine, new 5,000 ft. lines. $8,500 or trade for Bucyrus spudder. L. A. Bolte, R. #2, Brunswick, Ohio; W. Richfield 2423.

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FOR SALE

We carry a complete line of New Welding Fittings & Flanges—Also—New Steel, Cast-Iron & Brass Valves.

Any type and size

BUY AND SAVE

Write, wire or phone inquiries to

ACME VALVE & FITTINGS CO.
4914 Wentworth Ave.
Phone Boulevard 0900
CHICAGO, ILLINOIS

EQUIPMENT FOR SALE

FOR SALE: Two Type A-3, E. L. I. Portable Shot Hole Drills mounted on special 4-wheel trailers with Myers mud pumps, folding derricks, and 250 gallon water tanks. Complete with Briggs and Stratton engines, swivels, kellys, "A" rod, hose, etc., ready to operate. Ideal for 50′ to 100′ holes in swamp areas. Used six months. Good mechanical condition. One drill is complete with take-down derrick, Moyno portable pump, and spare engine. Location—Shreveport. Heiland Exploration Company, 630 Giddens-Lane Building, Shreveport, Louisiana.

FOR SALE
Sullivan Improved Model N Portable Drilling Rig. Immediate Delivery. Ready to go.

A REAL BUY
Buda Motor Powered A-1 condition; 1000 feet drill pipe and pipe straightener; 2 core barrels 20 feet long; 1 core barrel 10 feet long; 12—2 inch core bits and catchers; 1 reamer and bailer; 2—10 ton jacks; all small tools, wrenches, swivels, bolts, etc. All for $10,000.00. Harman Motor Co., Phone 722, Ballinger, Texas.

FOR SALE: I used Clarke 12½" by 14" Super Two Cycle 150 H. P. 2 Cylinder 300 RPM Angle Gas Compressor Engine Type RA-2S direct connected to 2—7"x14" V.T.L. Compressor Cylinders and two extra 12"x14" Compressor Cylinders. Box 376, Bradford, Pennsylvania.

CABLE DRILLING EQUIPMENT: Machines for shallow and deep drilling. Complete line drilling and fishing tools. Good used equipment, priced right. Also Sullivan core drill. S. W. Pressey, Pueblo, Colo.

TANK CARS

6—8 & 10,000 Gallons
offered at CUT prices

Inquiries Requested

BROWN-STRAUSS CORP.
P.O. Box 78 Kansas City 10, Mo

FOR SALE

50— 500 Barrels
10— 1,000 Barrels
20— 5,000 Barrels
4—10,000 Barrels

Heavy A.P.I. New closed bolted type steel tanks located at Ogden, Utah. Can quote reasonable prices in order to move from present premises at once.

JOS. GREENSPON'S SON PIPE CORP.
National Stock Yards
St. Clair County, Ill.

ETHYL PLANT

One—3250 gallon lead blending plant, complete with 30 ton scales weightograph; Goulds 5x4 centrifugal pump with 20 HP G. E. motor. All housed in 30x30 steel insulated building with 10'x10' brick wash room. Located Lewiston, Mont.
For complete information, write, call or wire

Brown-Strauss Corporation
P.O. Box 78 Phone Ha. 1000
1548 Guinotte Ave Kansas City, Mo.

EQUIPMENT FOR SALE

NEW HIGH-PRESSURE TOWERS

2—4′ ID x 40′ overall x 1½" shell thickness x 1⅝" head thickness. Welded, ASME code par U-68, stress relieved, seams X-rayed, fabricated by A. O. Smith Corp.

Wire—Phone—Write

PETROLEUM EQUIPMENT, INC.
P.O. Box 887, Tulsa, Okla. Phone 2-6291

REFINERY EQUIPMENT FOR SALE: Treating Drums, Bubble Towers, Flash Towers, Reboilers, Pipe Stills, Sharples Centrifuges, Root High Capacity Blowers, Structural Steel, Electric Fittings, numerous other items. Box 610, Mt. Pleasant, Texas.

CABLE DRILLING TOOLS: Complete line of drilling and fishing tools, supplies, lines, bits, casing, elevators and lease equipment. Orders filled promptly. Degen Pipe & Supply Company, Box 107, Red Fork Station, Tulsa, Oklahoma.

FOR SALE: One Model 61 Wichita Spudder, located at Wichita Falls, Texas, with 180 H.P. LeRoi Engine and tools, located at Artesia, New Mexico. One Jumbo J Fort Worth Spudder complete with tools, shear pole and 180 H.P. LeRoi Engine, located at Artesia, New Mexico. Brock Supply Company, Artesia, New Mexico.

FOR SALE

4—50-ton B-J hooks connected to 32" 3-sheave roller bearing McKissick traveling block.
4—Figure No. 1860 Gaso 4½x6 power pump powered with Buda K428 55 H.P. engines, mounted on skids. (In excellent condition).

H. A. McCARTHY
310 Thompson Bldg. Tulsa 3, Okla.

NEW CEMENT LINED PIPE

44,000 ft. 6⅝" x .280 wall, 18.97# Lapweld, with ¼" cement lining. Threads and protectors, less couplings. Location: Cambridge, Ohio.
HORWITZ PIPE & SUPPLY COMPANY
Tulsa, Okla.
P.O. Box 2534 Ph. 2-9128

FOR SALE, NEW AND USED TANKS

25—New A.P.I. Steel Bolted Tanks
50—New A.P.I. Low 500 Bolted Tanks
25—New A.P.I. High 500 bbl. Bolted
150—Good used Bolted 500 bbl., 1,000 bbl., good for Oil, Water or Grain, cut down and Reset Work.
New Welded Tanks all sizes, New Butane & Propane Tanks

INDEPENDENT TANK MFG. CO.
Seminole, Oklahoma
Phone 977 Box 102

FOR SALE

TUBES and PIPE

all types and sizes

Write, wire or phone for quotations. Also motors, machinery and kindred items.

SONKEN-GALAMBA Corporation
Kansas City 18, Kans.

STORAGE TANKS

Priced for Immediate Sale

New 1,000 bbl. bolted tanks crated 10-gauge throughout. Complete with all gaskets, fittings, and tools for erection. Call, wire or write for delivery prices.

1—55,000 bbl. riveted steel storage tank. Knocked down and matched marked.

1—80,000 bbl. welded steel storage tank, good condition, located near Kilgore, Texas.

REFINERY EQUIPMENT, Inc.

Subsidiary of Sonken-Galamba, Kansas City.

P. O. Box 1709, Tulsa, Oklahoma. L. D. 410

FOR SALE: 5,000′ 4½″ OD 16.60# Range 2 drill pipe with regular tool joints; 6,100′ 4½″ OD 16.60# Range 2 drill pipe with A.P.I. F.H. tool joints. Also 1 steel drilling rig complete with boilers and drill pipe capable of drilling 6,000′. 7 Nixon Gas Lifts complete with weights, lifts and line. Wire, write or phone Louisiana Iron & Supply Co., Shreveport, La.

NEW 300 H.P. COMPRESSOR—Immediate shipment one Clark 300 H.P. Model RA super 2-cycle right angle gas engine driven compressor equipped with two 15″ compressor cylinders 14x14 with complete equipment. Brand new, never used. R. H. Armstrong, Box 1191, Texas City, Texas. Telephone 1190.

FOR SALE: 12—230 H.P. Bessemer and Clark Horizontal Engines with new 17″ Power Heads. Engle Petroleum, Incorporated. P. O. Box 502, Salem, Illinois.

FOR SALE: 92 ft. Rotary Mast with steel sub structure. Harvey H. Sims, Salem, Illinois.

FOR SALE: 2 RXIV Le Roi 8 Cylinder 6¾″x7″ 225 HP. Engines completely overhauled with starting engines with or without Twin Disc clutches. Jack Gwynn Company, Ltd., Phone 6196, Wichita Falls, Texas.

FOR SALE: 24 Pumping Units. All types & sizes. New and used. Bridgeports, Jensens, Americans, Atlas, M.I.W. with or without Power. J. Glenn, Drumright, Oklahoma.

FOR SALE: 1—Used 12 trace Heiland Research Corporation Seismograph instrument unit, mounted on 39 Ford dual truck available for immediate delivery. Cities Service Oil Company, Patridge, Bartlesville, Oklahoma.

FOR SALE: At Aransas Pass, Texas; Three 180 RPM Clarke Two Cycle Gas Compressors 16″x20″ Power Cylinders and 7¼″x 20″ Compressor Cylinders, One 5½″x20″ Compressor Cylinder Type VS, One 13″x20″ Type "S" Double Acting Compressor Cylinder. Condition Very Good. Price $5,000.00. Bryant & Saner, Box 107, Kerrville, Texas.

FOR SALE

Equipment from two natural gasoline plants. Contact:

BOX 220

RANGER, TEXAS

DRILL PIPE

30,000′—3″

2,000′—4″

Suitable for structural purposes.

BANKOFF PIPE & SUPPLY CO.

Box 2301 Tulsa, Oklahoma

NOTICE—RECEIVERS SALE

Tulsa, Okla. 10:00 A. M. Wednesday, May 22

1—**USED PORTABLE HYDRAULIC SEISMOGRAPH SHOT HOLE DRILL** complete mounted on Ford cab over engine truck chassis, good condition, including 10 joints (100 Ft.) new drill pipe. Located at Electric Garage, 22 E. 11th St., Tulsa.

1—Lot—Inventory list miscellaneous shop tools and equipment including Dalton lathe with tools, drill press, pipe machine 2″ cap., work bench, bench vise, bench grinder, flexible shaft grinder, chain hoist, taps, dies, inside, outside and depth micrometers. Comb. welding and cutting torch with tips and head. Located at 2541 E. 25th St.

1—Lot—Inv. List Engineering drawing equipment—Hamilton drafting tables, drafting machine and instruments, triangles, squares, compass, slide rules, straight edges, letter guides, surveying chain, map cabinet, etc.

1—Lot—Inv. List office furniture, roll top, flat top desks, steno. desk, chairs, Royal typewriter, etc. Located at 1242 S. Boston.

For inspection see DECK WILMOTH, Receiver, Product Engineering Co. Phone 7251—P.O. Box 490, Tulsa, Okla.

TANT CAR SHELLS

100—8,000 gallon capacity

200—Trucks, consisting of wheels, axels, U type truck sides, spring planks, springs, bolsters and brake rigging.

100—Underframes for 8,000 gal. shells consisting of body bolsters, running boards, air brake cyclinders and reservoirs, couplers, draft gears and yokes.

BANKOFF PIPE & SUPPLY CO.

Box 2301 Tulsa, Okla.

ONE Ideal type K draw works complete with reverse clutch and compound unit with two 6-EKU Waukesha butane engines. One Wilson Giant draw works complete with rebuilt 2—JL-1335 Buda butane engines. P. O. Box 497, Tulsa, Okla. Phone 3-2882.

SITUATIONS WANTED

PETROLEUM ENGINEER, 20 years seasoned experience will make reports, appraisals, estimates, Rocky Mountain area, Kansas, Oklahoma. Thoroughly qualified to handle lease, royalty purchases & title curing on commission basis. Highest references available. Frank R. Young, 1611 Ridgeway, Colorado Springs, Colorado.

POSITION WANTED with an oil company in the Los Angeles area by university graduate with experience as head of Division Order Department and Scout and Land Departments in an independent oil company. Box B-221, The Oil and Gas Journal, Tulsa, Oklahoma.

ACCOUNTANT AND GENERAL OFFICE MAN, 9 years South America, fluent Spanish speech and writing; experience: material, shipping, industrial relations. Married, age 37, now employed Venezuela, desires new connection Latin American country. References at request, available one month notice. Box B-235, The Oil and Gas Journal, Tulsa, Oklahoma.

ASPHALT CHEMIST: 10 years refinery experience in asphalt and allied materials. Includes manufacture, blending, testing, and development work, mainly in supervisory capacity. Desires connection with progressive company in this field. Box B-233, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER—Age 40. 20 years general experience in drilling and production operations. Past six years general field engineering. Thorough knowledge of drilling, completions and workover operations, flush and stripper production. Supervisory experience in completion and workover operations. Desire connection with progressive independent or connection with opportunity for advancement. Box B-232, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST-ENGINEER: B. S. degree in geology and graduate studies in engineering and geophysics; member A.A.P.G. and A.I.M.E.; broad and varied experience with large oil companies and others in United States and Latin America; seeks new position; excellent references. Box B-227, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED Oil Accountant, presently employed by Public Accounting firm, desires new connection with private concern. Box B-230, The Oil and Gas Journal, Tulsa, Oklahoma.

OFFICE MANAGER, Chief Clerk, Accountant. Fifteen years oil experience. Now employed as Chief Accountant. Capable of handling any oil accounting job. Wish to make perament connection, future advancement more important than present salary. Box B-224, The Oil and Gas Journal, Tulsa, Oklahoma.

16 YEARS EXPERIENCE in general refinery process operation and maintenance. Now employed in other industry but desire refinery work. Any location. Box B-208, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEER: 20 years designing cementing and pumping equipment, pumps, desires connection to develop slush pump piston, valve and seat and small gathering system pumps. Box B-239, The Oil and Gas Journal, Tulsa, Oklahoma.

REGISTERED Petroleum and Natural Gas and Chemical Engineer desires position teaching vocational subjects of oil industry. Box B-241, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

COMBUSTION ENGINEER: M. E. Graduate, under 35 years for research and development work of oil heating furnaces, requiring knowledge of combustion and heat transfer calculations. Experience desirable, but not necessary, in design of heat absorbing surface arrangements. Send full details, incl. names of schools and former employers. Box B-240, The Oil and Gas Journal, Tulsa, Oklahoma.